Analytical Resources, LLC
Analytical Chemists and Consultants

18 July 2023

Andrea Fletcher
HydroGeoLogic, Inc.
6340 Glenwood, Building 7, Suite 200
Overland Park, KS 66202

RE: Portland Harbor Superfund Site 2021-2023

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
23F0627	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Kelly Bottem, Client Services Manager

PJLA Testing
DoD ELAP 66169

Cert# 100006-012

23F0627

ALS Environmental Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Karen Melerine

Project Number: K2306972
Project Manager: Karen Melerine
QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Date	Sample Time	Lab ID	Relinquish 2 None
K2306972-001	SIB-SED-MG-AAM169-NW-06172	1	Sediment	6/18/23	1320	ARI	X

Test Comments

Relinquish 2 - None K2306972-001 Metals/Hg

Special Instructions/Comments relinquish samples to ARI

Please provide the electronic (PDF and EDD) report to the following e-mail address: ~~ALKLS.Data@alsglobal.com.~~ email afletcher@hgl.com and lnyland@hgl.com

Contact HGL with any questions - Andrea Fletcher or Linda Nyland

H - Test is On Hold P - Test is Authorized for Prep Only

Turnaround Requirements

____ **RUSH** (Surcharges Apply)

PLEASE CIRCLE WORK DAYS

1 2 3 4 5

____ **STANDARD**

Requested FAX Date: _____

Requested Report Date: 07/10/23

Report Requirements

____ I. Results Only

____ II. Results + QC Summaries

____ III. Results + QC and Calibration Summaries

____ IV. Data Validation Report with Raw Data

PQL/MDL/J Y

EDD Y

Invoice Information

PO# 51K2306972

Bill to

Relinquished By: [signature] 6/22

Received By: [signature] 06292023

Airbill Number:

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: ALS environmental

Project Name: K23306972

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 23F0627

Tracking No: 6195 1660 9776 (NA) KFC 06272023

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? ..... YES NO

Were custody papers properly filled out (ink, signed, etc.) ..... YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 09:37 5.1 ____ ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: J009708

Cooler Accepted by: KFC Date: 06272023 Time: 09:37

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? ..... YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? ..... NA YES NO

How were bottles sealed in plastic bags? ..... Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? ..... YES NO

Were all bottle labels complete and legible? ..... YES NO

Did the number of containers listed on COC match with the number of containers received? ..... YES NO

Did all bottle labels and tags agree with custody papers? ..... YES NO

Were all bottles used correct for the requested analyses? ..... YES NO S.R

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO 6/27

Were all VOC vials free of air bubbles? ..... NA YES NO

Was sufficient amount of sample sent in each bottle? ..... YES NO

Date VOC Trip Blank was made at ARI..... NA _____

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: S.R/MD Date: 6/27/23 Time: 16:03 Labels checked by: MD

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

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HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023	
6340 Glenwood, Building 7, Suite 200	Project Number:	[none]	**Reported:**
Overland Park, KS 66202	Project Manager:	Andrea Fletcher	07/18/2023 09:35

ANALYTICAL REPORT FOR SAMPLES

Laboratory ID	Sample ID	Matrix	Date Sampled	Date Received
23F0627-01	SIB-SED-MG-AAM169-NW-06172	Solid	06/18/23 13:20	06/27/23 09:37

HydroGeoLogic, Inc.	Project: Portland Harbor Superfund Site 2021-2023	
6340 Glenwood, Building 7, Suite 200	Project Number: [none]	**Reported:**
Overland Park KS, 66202	Project Manager: Andrea Fletcher	18-Jul-2023 09:35

Case Narrative

Total Metals - EPA Method 6020B and 7471B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The SRM is in control.

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QUALIFIERS AND NOTES

Qualifier	Definition
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
L	Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to +/- RL instead of 20% RPD
J	Estimated concentration value detected below the reporting limit.
H	Hold time violation - Hold time was exceeded.
D	The reported value is from a dilution
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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Tukwila, WA

ICP-MS Metals

Analyzed with Secondary Isotopes

ICPMS metals are quantitated with the primary Ion and major wavelength unless interference is noted. When secondary ions are used for quantitation, both ions will be reported for laboratory and matrix QC.

These results were reported from a secondary ion:

Labnumber	SampleName	Analyte
23F0627-01	SIB-SED-MG-AAM169-NW-06172	Zinc-67

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Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

SIB-SED-MG-AAM169-NW-06172

Laboratory:	Analytical Resources, LLC				
Client:	HydroGeoLogic, Inc.				
Project:	Portland Harbor Superfund Site 2021-2023				
Matrix:	Sediment	Laboratory ID:	23F0627-01 A	SDG:	23F0627
Sampled:	06/18/23 13:20	Prepared:	07/12/23 10:49	File ID:	XDT_m1230714-107
% Solids:	78.54	Preparation:	SWN EPA 3050B	Analyzed:	07/14/23 22:56
Batch:	BLG0203	Sequence:	SLG0175	Initial/Final:	1.01 g Wet / 50 mL
Instrument:	ICPMS1			Calibration:	GG00039

CAS NO.	Analyte	Concentration (mg/kg dry)	Dilution Factor	MDL	LOD	LOQ	Q
7439-92-1	Lead	8.76	20	0.07	0.09	0.13	

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PREPARATION BATCH SUMMARY

EPA 6020B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Batch:	BLG0203 Batch Matrix: Solid	Preparation:	SWN EPA 3050B

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	07/12/23 10:49	Solids, use this one
Blank	BLG0203-BLK1	XDT_m1230714-063	07/12/23 10:49	
LCS	BLG0203-BS1	XDT_m1230714-064	07/12/23 10:49	
Reference	BLG0203-SRM1	XDT_m1230714-071	07/12/23 10:49	

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Digestion Log

Analyst: AS Date: 7/12/23 - 7/13/23 Time: 17:40 - 14:15 Balance ID: BAL10

Matrix: Solid Block ID: ~~BA~~ 3 Block Temp: 94C Thermometer: 20-4

ARI Sample ID	Btl #	pH<2	Prep Code: SWN Initial Wt (g) Vol (mL)	Prep Code: SWN Final Vol (mL)	Prep Code: Initial Wt (g) Vol (mL)	Prep Code: Final Vol (mL)	Comments
23F0303-01	A		1.064	50			
-02			1.086				
-03	B		1.029				
-04	A		1.013				
-05			1.002				
-06			1.009				
-07			1.073				
-08			1.009				
-09			1.039				
-10			1.027				
-11			1.053				
-12			1.018				
-13	B		1.041				
-14	A		1.042				
-15			1.020				
-16			1.071				
-17			1.038				
-18			1.069				
-19			1.008				
23F0627-01			1.010				
BLG0223-BLK	—		—				
-BS	—		—				
-DUP	—		1.064				23F0303-01
-MS	—		1.060				
-MSD	—		1.060				
-SRM	—		1.002				

Chemical/Reagent ID:

HNO_3: L560S 1:1 HNO_3: L6981 HCl: — H_2O_2: K11056

Tube Lot#: 2206050 Boiling Chip Lot#: — (DoD Only)

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Form I

METHOD BLANK DATA SHEET

EPA 6020B

Total Metals

Blank

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021
Batch: BLG0203
Laboratory ID: BLG0203-BLK1
Prepared: 07/12/23 10:49
Matrix: Solid
Preparation: SWN EPA 3050B
Analyzed: 07/14/23 19:38
Sequence: SLG0175
Calibration: GG00039
Instrument: ICPMS1

CAS NO.	Analyte	Concentration (mg/kg wet)	Dilution Factor	MDL	LOD	LOQ	Q
7439-92-1	Lead-208	ND	20	0.05	0.07	0.10	U

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LCS / LCS DUPLICATE RECOVERY

EPA 6020B

Total Metals

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Matrix:	Solid	Analyzed:	07/14/23 19:42
Batch:	BLG0203	Laboratory ID:	BLG0203-BS1
Preparation:	SWN EPA 3050B	Sequence Name:	LCS
Initial/Final:	1 g / 50 mL		

COMPOUND	SPIKE ADDED (mg/kg wet)	LCS CONCENTRATION (mg/kg wet)	Q	LCS % REC. #	QC LIMITS REC.
Lead-208	25.0	27.8		111	80 - 120

* Indicates values outside of QC limits

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STANDARD REFERENCE MATERIAL RECOVERY

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Matrix: Solid
Laboratory ID: BLG0203-SRM1
Batch: BLG0203
Initial/Final: 1.002 g / 50 mL
Preparation: SWN EPA 3050B
Analyzed: 07/14/2023 20:12
Standard ID: L000950
Expires: 04/01/2026
Standard Lot#: D120-540
Description: Metals In Soil

ANALYTE	TRUE (mg/kg wet)	FOUND (mg/kg wet)	MDL	LOQ	Q	SRM % REC.	QC LIMITS REC.
Lead-208	247.00	188	0.13	0.25	D	76.1	68.8 - 102.4

* Values outside of QC limits

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INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Control Limt: +/- 10.00%
Sequence: SLG0175

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SLG0175-ICV1	Lead-208	50.000	52.7	105	ug/L	EPA 6020B
SLG0175-CCV1	Lead-208	50.000	52.3	105	ug/L	EPA 6020B
SLG0175-CCV2	Lead-208	50.000	49.0	98.0	ug/L	EPA 6020B
SLG0175-CCV3	Lead-208	50.000	50.1	100	ug/L	EPA 6020B
SLG0175-CCV6	Lead-208	50.000	51.6	103	ug/L	EPA 6020B
SLG0175-CCV7	Lead-208	50.000	50.9	102	ug/L	EPA 6020B
SLG0175-CCV8	Lead-208	50.000	50.6	101	ug/L	EPA 6020B
SLG0175-CCV9	Lead-208	50.000	51.1	102	ug/L	EPA 6020B
SLG0175-CCVA	Lead-208	50.000	51.1	102	ug/L	EPA 6020B
SLG0175-CCVB	Lead-208	50.000	50.9	102	ug/L	EPA 6020B
SLG0175-CCVC	Lead-208	50.000	48.9	97.8	ug/L	EPA 6020B
SLG0175-CCVD	Lead-208	50.000	49.8	99.7	ug/L	EPA 6020B
SLG0175-CCVE	Lead-208	50.000	52.8	106	ug/L	EPA 6020B

* Values outside of QC limits

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INSTRUMENT BLANKS
EPA 6020B

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/14/23 15:41

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-IBL1	Lead-208	0.00400	0.0513	0.100	ug/L	
SLG0175-ICB1	Lead-208	0.00100	0.0513	0.100	ug/L	
SLG0175-CCB1	Lead-208	0.00100	0.0513	0.100	ug/L	
SLG0175-IBL2	Lead-208	0.00800	0.0513	0.100	ug/L	
SLG0175-IBL3	Lead-208	0.00600	0.0513	0.100	ug/L	
SLG0175-CCB2	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-IBL4	Lead-208	0.00800	0.0513	0.100	ug/L	
SLG0175-CCB3	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-CCB6	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-IBL8	Lead-208	0.0130	0.0513	0.100	ug/L	
SLG0175-CCB7	Lead-208	0.00300	0.0513	0.100	ug/L	
SLG0175-IBL9	Lead-208	0.00600	0.0513	0.100	ug/L	
SLG0175-CCB8	Lead-208	0.00300	0.0513	0.100	ug/L	
SLG0175-IBLA	Lead-208	0.00400	0.0513	0.100	ug/L	
SLG0175-CCB9	Lead-208	0.00400	0.0513	0.100	ug/L	
SLG0175-IBLB	Lead-208	0.00500	0.0513	0.100	ug/L	
SLG0175-CCBA	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-CCBB	Lead-208	0.00100	0.0513	0.100	ug/L	
SLG0175-IBLC	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-CCBC	Lead-208	0.00800	0.0513	0.100	ug/L	
SLG0175-IBLD	Lead-208	0.00300	0.0513	0.100	ug/L	
SLG0175-IBLE	Lead-208	0.00	0.0513	0.100	ug/L	
SLG0175-CCBD	Lead-208	-0.00100	0.0513	0.100	ug/L	
SLG0175-IBLF	Lead-208	0.00100	0.0513	0.100	ug/L	
SLG0175-IBLG	Lead-208	0.00200	0.0513	0.100	ug/L	
SLG0175-IBLH	Lead-208	-0.00100	0.0513	0.100	ug/L	
SLG0175-CCBE	Lead-208	0.0110	0.0513	0.100	ug/L	

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ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SLG0175-CAL1	XDT_m1230714-006	NA	07/14/23 15:09
CAL 1 - LOW CHECK	SLG0175-CAL2	XDT_m1230714-007	NA	07/14/23 15:13
CAL 2	SLG0175-CAL3	XDT_m1230714-008	NA	07/14/23 15:18
CAL 3	SLG0175-CAL4	XDT_m1230714-009	NA	07/14/23 15:22
CAL 4	SLG0175-CAL5	XDT_m1230714-010	NA	07/14/23 15:27
CAL 5	SLG0175-CAL6	XDT_m1230714-011	NA	07/14/23 15:33
RINSE	SLG0175-IBL1	XDT_m1230714-012	NA	07/14/23 15:41
Initial Cal Check	SLG0175-ICV1	XDT_m1230714-014	NA	07/14/23 15:47
Initial Cal Blank	SLG0175-ICB1	XDT_m1230714-016	NA	07/14/23 16:00
Calibration Check	SLG0175-CCV1	XDT_m1230714-017	NA	07/14/23 16:04
Calibration Blank	SLG0175-CCB1	XDT_m1230714-019	NA	07/14/23 16:17
Instrument RL Check	SLG0175-CRL1	XDT_m1230714-020	NA	07/14/23 16:21
Interference Check B	SLG0175-IFB1	XDT_m1230714-022	NA	07/14/23 16:31
LR200	SLG0175-HCV1	XDT_m1230714-023	NA	07/14/23 16:35
LR300	SLG0175-HCV2	XDT_m1230714-024	NA	07/14/23 16:40
Instrument Blank	SLG0175-IBL2	XDT_m1230714-025	NA	07/14/23 16:47
Interference Check A	SLG0175-IFA1	XDT_m1230714-026	NA	07/14/23 16:53
Instrument Blank	SLG0175-IBL3	XDT_m1230714-027	NA	07/14/23 16:57
Calibration Check	SLG0175-CCV2	XDT_m1230714-028	NA	07/14/23 17:03
Calibration Blank	SLG0175-CCB2	XDT_m1230714-029	NA	07/14/23 17:10
Instrument Blank	SLG0175-IBL4	XDT_m1230714-036	NA	07/14/23 17:44
Calibration Check	SLG0175-CCV3	XDT_m1230714-037	NA	07/14/23 17:48
Calibration Blank	SLG0175-CCB3	XDT_m1230714-038	NA	07/14/23 17:56
Calibration Check	SLG0175-CCV6	XDT_m1230714-061	NA	07/14/23 19:27
Calibration Blank	SLG0175-CCB6	XDT_m1230714-062	NA	07/14/23 19:34
Blank	BLG0203-BLK1	XDT_m1230714-063	Solid	07/14/23 19:38
LCS	BLG0203-BS1	XDT_m1230714-064	Solid	07/14/23 19:42
Reference	BLG0203-SRM1	XDT_m1230714-071	Solid	07/14/23 20:12
Instrument Blank	SLG0175-IBL8	XDT_m1230714-072	NA	07/14/23 20:17

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ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SLG0175-CCV7	XDT_m1230714-073	NA	07/14/23 20:21
Calibration Blank	SLG0175-CCB7	XDT_m1230714-074	NA	07/14/23 20:28
ZZZZZ	23F0303-02	XDT_m1230714-075	Solid	07/14/23 20:32
ZZZZZ	23F0303-03	XDT_m1230714-076	Solid	07/14/23 20:37
ZZZZZ	23F0303-05	XDT_m1230714-078	Solid	07/14/23 20:45
ZZZZZ	23F0303-06	XDT_m1230714-079	Solid	07/14/23 20:50
ZZZZZ	23F0303-07	XDT_m1230714-080	Solid	07/14/23 20:54
ZZZZZ	23F0303-08	XDT_m1230714-081	Solid	07/14/23 20:58
ZZZZZ	23F0303-09	XDT_m1230714-082	Solid	07/14/23 21:03
ZZZZZ	23F0303-10	XDT_m1230714-083	Solid	07/14/23 21:07
Instrument Blank	SLG0175-IBL9	XDT_m1230714-084	NA	07/14/23 21:11
Calibration Check	SLG0175-CCV8	XDT_m1230714-085	NA	07/14/23 21:16
Calibration Blank	SLG0175-CCB8	XDT_m1230714-086	NA	07/14/23 21:23
ZZZZZ	23F0303-11	XDT_m1230714-087	Solid	07/14/23 21:27
ZZZZZ	23F0303-12	XDT_m1230714-088	Solid	07/14/23 21:31
ZZZZZ	23F0303-13	XDT_m1230714-089	Solid	07/14/23 21:36
ZZZZZ	23F0303-14	XDT_m1230714-090	Solid	07/14/23 21:40
ZZZZZ	23F0303-15	XDT_m1230714-091	Solid	07/14/23 21:44
ZZZZZ	23F0303-16	XDT_m1230714-092	Solid	07/14/23 21:49
ZZZZZ	23F0303-17	XDT_m1230714-093	Solid	07/14/23 21:53
ZZZZZ	23F0303-18	XDT_m1230714-094	Solid	07/14/23 21:57
ZZZZZ	23F0303-19	XDT_m1230714-095	Solid	07/14/23 22:01
Instrument Blank	SLG0175-IBLA	XDT_m1230714-096	NA	07/14/23 22:06
Calibration Check	SLG0175-CCV9	XDT_m1230714-097	NA	07/14/23 22:10
Calibration Blank	SLG0175-CCB9	XDT_m1230714-098	NA	07/14/23 22:17
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	Solid	07/14/23 22:56
Instrument Blank	SLG0175-IBLB	XDT_m1230714-108	NA	07/14/23 23:01
Calibration Check	SLG0175-CCVA	XDT_m1230714-109	NA	07/14/23 23:05
Calibration Blank	SLG0175-CCBA	XDT_m1230714-110	NA	07/14/23 23:12

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ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SLG0175-CCVB	XDT_m1230714-112	NA	07/14/23 23:21
Calibration Blank	SLG0175-CCBB	XDT_m1230714-113	NA	07/14/23 23:28
Instrument Blank	SLG0175-IBLC	XDT_m1230714-123	NA	07/15/23 00:11
Calibration Check	SLG0175-CCVC	XDT_m1230714-124	NA	07/15/23 00:16
Calibration Blank	SLG0175-CCBC	XDT_m1230714-125	NA	07/15/23 00:23
Instrument Blank	SLG0175-IBLD	XDT_m1230714-128	NA	07/15/23 00:35
Instrument Blank	SLG0175-IBLE	XDT_m1230714-135	NA	07/15/23 01:06
Calibration Check	SLG0175-CCVD	XDT_m1230714-136	NA	07/15/23 01:11
Calibration Blank	SLG0175-CCBD	XDT_m1230714-137	NA	07/15/23 01:18
Instrument Blank	SLG0175-IBLF	XDT_m1230714-140	NA	07/15/23 01:31
Instrument Blank	SLG0175-IBLG	XDT_m1230714-144	NA	07/15/23 01:49
Instrument Blank	SLG0175-IBLH	XDT_m1230714-147	NA	07/15/23 02:02
Calibration Check	SLG0175-CCVE	XDT_m1230714-148	NA	07/15/23 02:06
Calibration Blank	SLG0175-CCBE	XDT_m1230714-149	NA	07/15/23 02:13

Analytical Resources, LLC
Analytical Chemists and Consultants

ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Standard ID: L007219

Lab Sample ID	Analyte	True	Found	%R	Units
SLG0175-IFA1	Lead-208	0	0.0270		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.

Analytical Resources, LLC
Analytical Chemists and Consultants

ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Standard ID: L007219

Lab Sample ID	Analyte	True	Found	%R	Units
SLG0175-IFB1	Lead-208	0	0.0230		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.

Analytical Resources, LLC
Analytical Chemists and Consultants

DETECTION LEVEL STANDARD
EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Lab Sample ID: SLG0175-CRL1

Analyte	True	Found	%R	Units	QC Limts
Lead-208	0.10000	0.112	112	ug/L	50 - 150

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Calibration: GG00039
Laboratory ID: SLG0175-HCV1
Sequence: SLG0175
Standard ID: L007534

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Lead-208	200.00	200	-0.07	10.00

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Calibration: GG00039
Laboratory ID: SLG0175-HCV2
Sequence: SLG0175
Standard ID: L007306

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Lead-208	300.00	291	-3.1	10.00

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HOLDING TIME SUMMARY

Analysis: EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
SIB-SED-MG-AAM169-NW-06172 23F0627-01	06/18/23 13:20	06/27/23 09:37	07/12/23 10:49	23	730	07/14/23 22:56	26	730	

* Indicates hold time exceedance.

Analytical Resources, LLC
Analytical Chemists and Consultants

METHOD DETECTION AND REPORTING LIMITS

EPA 6020B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-202
Matrix: Solid
Instrument: ICPMS1

Analyte	MDL	LOD	Units
Lead-208	0.05	0.07	mg/kg

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCU10
Lot Number:	P2-CU682108
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Copper
Starting Material:	Cu Metal
Starting Material Lot#:	2095
Starting Material Purity:	99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 30 µg/mL

Density: 1.032 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9977 ± 50 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 121207

Assay Method #2 **10024 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10007 ± 46 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.007542	M	Eu	<	0.000942	O	Na		0.001434	M	Se	<	0.016971	M	Zn	<	0.005657
O	Al	<	0.000609	O	Fe		0.008700	M	Nb	<	0.000942	O	Si		0.003052	M	Zr	<	0.000942
M	As	<	0.010371	M	Ga	<	0.000942	M	Nd	<	0.000942	M	Sm	<	0.000942				
M	Au	<	0.001885	M	Gd	<	0.000942	M	Ni		0.003781	M	Sn	<	0.005657				
O	B		0.003663	M	Ge	<	0.005657	M	Os	<	0.000942	M	Sr	<	0.000942				
M	Ba		0.004253	M	Hf	<	0.000942	O	P	<	0.031668	M	Ta	<	0.000942				
M	Be	<	0.000942	O	Hg	<	0.007064	M	Pb		0.005789	M	Tb	<	0.000942				
M	Bi	<	0.000942	M	Ho	<	0.000942	M	Pd	<	0.000942	M	Te	<	0.004714				
O	Ca		0.002304	M	In	<	0.000942	M	Pr	<	0.000942	M	Th	<	0.000942				
M	Cd	<	0.000942	M	Ir	<	0.000942	M	Pt	<	0.000942	O	Ti	<	0.002801				
M	Ce	<	0.000942	O	K		0.000763	M	Rb	<	0.000942	M	Tl	<	0.000942				
M	Co		0.001890	M	La	<	0.000942	M	Re	<	0.000942	M	Tm	<	0.000942				
M	Cr	<	0.005657	O	Li	<	0.000243	i	Rh	<		M	U	<	0.000942				
M	Cs	<	0.000942	M	Lu	<	0.000942	M	Ru	<	0.039588	M	V	<	0.003771				
s	Cu	<		O	Mg		0.000320	O	S		0.007174	M	W	<	0.005657				
M	Dy	<	0.000942	O	Mn		0.000793	M	Sb	<	0.001885	M	Y	<	0.000942				
M	Er	<	0.000942	M	Mo	<	0.005657	M	Sc	<	0.000942	M	Yb	<	0.000942				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4, HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Cu Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/.002 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/.001 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/.001 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 24, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 24, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGPB10
Lot Number:	S2-PB713228
Matrix:	0.5% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Lead
Starting Material:	Lead Nitrate
Starting Material Lot#:	2343
Starting Material Purity:	99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10042 ± 31 µg/mL

Density: 1.015 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10024 ± 41 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 101026

Assay Method #2 **10054 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000310	M	Eu	<	0.000310	M	Na		0.001470	M	Se	<	0.009100	O	Zn		0.006155
O	Al		0.017098	O	Fe		0.002496	M	Nb	<	0.000310	O	Si		0.003761	O	Zr	<	0.001700
M	As	<	0.003100	M	Ga	<	0.000310	M	Nd	<	0.000310	M	Sm	<	0.000310				
M	Au	<	0.000910	M	Gd	<	0.000310	O	Ni		0.001709	M	Sn	<	0.001300				
O	B	<	0.005600	M	Ge	<	0.002200	M	Os	<	0.000310	O	Sr		0.000444				
O	Ba		0.007865	M	Hf	<	0.000310	O	P	<	0.038000	M	Ta	<	0.000310				
O	Be	<	0.000320	M	Hg	<	0.002200	s	Pb	<		M	Tb	<	0.000610				
M	Bi	<	0.028000	M	Ho	<	0.000310	M	Pd	<	0.000610	M	Te	<	0.000310				
O	Ca		0.019834	M	In	<	0.000310	M	Pr	<	0.000310	M	Th	<	0.000310				
O	Cd	<	0.000630	M	Ir	<	0.000310	M	Pt	<	0.000910	O	Ti		0.005129				
M	Ce		0.004787	O	K		0.008207	M	Rb	<	0.006700	M	Tl	<	0.016000				
M	Co	<	0.000610	M	La	<	0.001900	M	Re	<	0.000310	M	Tm	<	0.000310				
O	Cr	<	0.001500	O	Li	<	0.000110	O	Rh	<	0.007700	M	U	<	0.000310				
M	Cs	<	0.006100	M	Lu	<	0.000310	M	Ru	<	0.001300	M	V	<	0.001600				
M	Cu	<	0.001600	O	Mg		0.003317	O	S	<	0.052000	M	W	<	0.000910				
M	Dy	<	0.000310	O	Mn	<	0.001600	O	Sb	<	0.015000	M	Y	<	0.000310				
M	Er	<	0.000310	M	Mo	<	0.000610	O	Sc	<	0.000630	M	Yb	<	0.000310				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.20 +2 6 Pb(H2O)6+2

Chemical Compatibility - Soluble in HCl, HF and HNO3. Avoid H2SO4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Pb Containing Samples (Preparation and Solution) -Metal (Best dissolved in 1:1 H2O / HNO3); Oxides (The many different Pb oxides are soluble in HNO3 with the exception of PbO2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H2O / HNO3); Organic Matrices (Dry ash and dissolve in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 208 amu	5 ppt	n/a	192Pt16O, 192Os16O
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	Co
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	W, Ir, Hf, Sb, Th
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	Bi, Nb

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 10, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 10, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

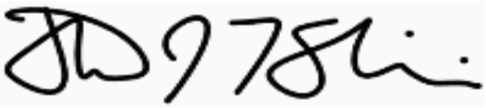
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGZN10
Lot Number:	S2-ZN711249
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Zinc
Starting Material:	Zinc Metal
Starting Material Lot#:	2349
Starting Material Purity:	99.9988%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 30 µg/mL

Density: 1.029 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9981 ± 56 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 120629

Assay Method #2 **9987 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10002 ± 32 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002000	M	Eu	<	0.000500	O	Na		0.008713	M	Se	<	0.048000	s	Zn	<	
O	Al	<	0.011000	O	Fe		0.015467	M	Nb	<	0.000500	O	Si		0.007842	M	Zr	<	0.000500
O	As	<	0.012000	M	Ga	<	0.004900	M	Nd	<	0.000500	M	Sm	<	0.000500				
M	Au	<	0.006500	M	Gd	<	0.000500	O	Ni		0.003049	M	Sn		0.002614				
O	B	<	0.019000	M	Ge	<	0.009100	M	Os	<	0.000500	M	Sr	<	0.000500				
M	Ba	<	0.000500	M	Hf	<	0.000500	O	P	<	0.059000	M	Ta	<	0.000500				
O	Be	<	0.000230	O	Hg	<	0.003800	M	Pb		0.016774	M	Tb	<	0.000500				
M	Bi	<	0.002400	M	Ho	<	0.000500	M	Pd	<	0.001000	M	Te	<	0.017000				
O	Ca		0.052283	M	In	<	0.003500	M	Pr	<	0.000500	M	Th	<	0.000500				
O	Cd		0.000588	M	Ir	<	0.001000	M	Pt	<	0.000500	M	Ti	<	0.002000				
M	Ce	<	0.000500	O	K		0.017209	M	Rb	<	0.002500	M	Tl	<	0.000500				
M	Co		0.000653	M	La	<	0.000500	M	Re	<	0.000500	M	Tm	<	0.000500				
O	Cr		0.001089	O	Li	<	0.000230	M	Rh	<	0.000500	M	U	<	0.000500				
M	Cs	<	0.000500	M	Lu	<	0.000500	M	Ru	<	0.005000	M	V	<	0.000500				
O	Cu		0.001938	O	Mg		0.000871	O	S	<	0.048000	M	W	<	0.001000				
M	Dy	<	0.000500	O	Mn		0.000172	M	Sb	<	0.004300	M	Y	<	0.000500				
M	Er	<	0.000500	M	Mo	<	0.001500	O	Sc	<	0.000900	M	Yb	<	0.000500				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 22, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 22, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

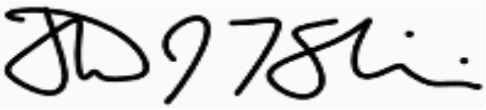
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGSE10
Lot Number:	S2-SE711004
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Selenium
Starting Material:	Se Metal
Starting Material Lot#:	1962
Starting Material Purity:	99.9991%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9955 ± 61 µg/mL

Density: 1.035 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9955 ± 50 µg/mL**
ICP Assay NIST SRM 3149 Lot Number: 100901

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002242	M	Eu	<	0.000373	O	Na		0.013654	s	Se	<		O	Zn		0.002374
M	Al		0.004450	M	Fe		0.008478	O	Nb	<	0.002975	O	Si		0.006249	M	Zr	<	0.001868
O	As	<	0.022040	M	Ga	<	0.000373	M	Nd	<	0.000373	M	Sm	<	0.000373				
M	Au	<	0.000373	M	Gd	<	0.000373	O	Ni		0.001843	M	Sn		0.000847				
O	B	<	0.007714	M	Ge	<	0.002616	M	Os	<	0.000373	M	Sr	<	0.001121				
M	Ba	<	0.001495	M	Hf	<	0.000373	O	P	<	0.022040	M	Ta	<	0.000373				
M	Be	<	0.001495	M	Hg	<	0.002240	M	Pb		0.006358	M	Tb	<	0.006353				
M	Bi	<	0.000373	M	Ho	<	0.000373	M	Pd	<	0.000373	M	Te	<	0.012707				
O	Ca		0.006530	M	In	<	0.000373	M	Pr	<	0.001495	M	Th	<	0.002990				
M	Cd		0.001165	M	Ir	<	0.000373	M	Pt	<	0.000373	M	Ti	<	0.003363				
M	Ce	<	0.000373	O	K		0.001999	M	Rb	<	0.001868	M	Tl		0.008584				
M	Co	<	0.000373	M	La	<	0.001121	M	Re	<	0.000373	M	Tm	<	0.000373				
M	Cr		0.002861	O	Li		0.000062	M	Rh	<	0.000373	M	U	<	0.000373				
M	Cs	<	0.001121	M	Lu	<	0.000373	M	Ru	<	0.001493	M	V	<	0.000747				
M	Cu	<	0.000747	O	Mg		0.001156	O	S		0.024591	M	W	<	0.002242				
M	Dy	<	0.000373	M	Mn	<	0.000373	M	Sb	<	0.002242	M	Y	<	0.000373				
M	Er	<	0.000373	O	Mo	<	0.003195	M	Sc	<	0.001121	M	Yb	<	0.000373				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96 +4 6 H_2SeO_3

Chemical Compatibility -Soluble in HCl, HNO_3,H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) -Metal (soluble in HNO_3); Oxides (readily soluble in water); Minerals and alloys (acid digestion with HNO_3or HNO_3 / HF); Organic Matrices (acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 82 amu	200 ppt	N/A	12C35Cl2
ICP-OES 196.026 nm	0.08/0.006 µg/mL	1	Fe
ICP-OES 203.985 nm	0.2/0.05 µg/mL	1	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3/0.16 µg/mL	1	Cr, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 17, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 17, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

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ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMO10
Lot Number:	S2-MO706255
Matrix:	H2O tr. NH4OH
Value / Analyte(s):	10 000 µg/mL ea: Molybdenum
Starting Material:	Ammonium Molybdate
Starting Material Lot#:	2361
Starting Material Purity:	99.9893%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10026 ± 47 µg/mL

Density: 1.011 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10032 ± 68 µg/mL**
ICP Assay NIST SRM 3134 Lot Number: 130418

Assay Method #2 **10020 ± 65 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000590	M	Eu	<	0.000300	M	Na		0.008739	M	Se	<	0.008000	M	Zn		0.005942
M	Al		0.005592	M	Fe	<	0.006500	M	Nb	<	0.029000	i	Si	<		M	Zr	<	0.001800
M	As	<	0.002100	M	Ga	<	0.000300	i	Nd	<		M	Sm	<	0.000300				
M	Au	<	0.000300	M	Gd	<	0.000300	M	Ni	<	0.008000	M	Sn	<	0.008900				
M	B	<	0.003300	M	Ge	<	0.000300	M	Os	<	0.000590	M	Sr		0.001747				
M	Ba		0.016778	M	Hf	<	0.001800	i	P	<		M	Ta	<	0.004200				
M	Be	<	0.000890	M	Hg	<	0.003300	M	Pb	<	0.000300	M	Tb	<	0.000300				
M	Bi	<	0.000890	M	Ho	<	0.000300	M	Pd	<	0.001800	M	Te	<	0.021000				
O	Ca		0.062920	M	In	<	0.032000	M	Pr	<	0.013000	M	Th	<	0.000300				
O	Cd	<	0.026000	M	Ir	<	0.000300	M	Pt	<	0.000300	O	Ti	<	0.032000				
M	Ce	<	0.008300	M	K		1.293372	M	Rb		0.045442	M	Tl		0.012584				
M	Co		0.005942	M	La	<	0.000300	M	Re	<	0.000300	M	Tm	<	0.000300				
M	Cr		0.005243	O	Li		0.000594	M	Rh	<	0.000300	M	U	<	0.005300				
M	Cs		0.005243	M	Lu	<	0.000300	M	Ru	<	0.079000	M	V	<	0.000890				
M	Cu		0.022371	M	Mg		0.005592	i	S	<		M	W		0.873900				
M	Dy	<	0.000300	M	Mn	<	0.005900	M	Sb		0.015031	M	Y	<	0.000300				
M	Er	<	0.000300	s	Mo	<		M	Sc	<	0.001200	M	Yb	<	0.000300				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH) ; Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 95 amu	3 ppt	n/a	40Ar39K16O,79Br16O,190Os2+,190Pt2+
ICP-OES 202.030 nm	0.008 / 0.0002 µg/mL	1	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 µg/mL	1	
ICP-OES 204.598 nm	0.012 / 0.001 µg/mL	1	Ir, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 04, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **July 04, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGTL10
Lot Number:	T2-TL714687
Matrix:	5% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Thallium
Starting Material:	TlNO3
Starting Material Lot#:	2118
Starting Material Purity:	99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10030 ± 42 µg/mL

Density: 1.036 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10040 ± 43 µg/mL**
ICP Assay NIST SRM 3158 Lot Number: 151215

Assay Method #2 **10010 ± 65 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL(

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000200	M	Eu	<	0.000200	O	Na		0.002489	M	Se	<	0.011019	O	Zn		0.002298
O	Al	<	0.004184	O	Fe	<	0.002824	M	Nb	<	0.000200	O	Si		0.003760	M	Zr	<	0.000200
M	As	<	0.002003	M	Ga	<	0.000200	M	Nd	<	0.000200	M	Sm	<	0.000200				
O	Au	<	0.002824	M	Gd	<	0.000200	M	Ni		0.001724	M	Sn	<	0.000601				
O	B	<	0.004184	M	Ge	<	0.000801	M	Os	<	0.000198	O	Sr	<	0.000313				
M	Ba	<	0.000400	M	Hf	<	0.000200	O	P	<	0.010460	M	Ta	<	0.000200				
O	Be	<	0.000104	M	Hg	<	0.000794	M	Pb		0.000811	M	Tb	<	0.000200				
M	Bi	<	0.005209	M	Ho	<	0.000200	M	Pd	<	0.000400	M	Te	<	0.005008				
O	Ca		0.002436	M	In	<	0.000200	M	Pr	<	0.000200	M	Th	<	0.000200				
M	Cd		0.001318	M	Ir	<	0.000198	M	Pt	<	0.000801	O	Ti	<	0.001255				
M	Ce	<	0.000200	O	K		0.006175	M	Rb	<	0.000200	s	Tl	<					
M	Co	<	0.000601	M	La	<	0.000200	M	Re	<	0.000200	M	Tm	<	0.000200				
M	Cr	<	0.000801	O	Li	<	0.000177	M	Rh	<	0.000200	M	U	<	0.000200				
M	Cs	<	0.003606	M	Lu	<	0.000200	M	Ru	<	0.000397	M	V	<	0.002203				
M	Cu	<	0.001001	O	Mg		0.000529	O	S	<	0.015690	M	W	<	0.000601				
M	Dy	<	0.000200	M	Mn	<	0.000801	M	Sb	<	0.000400	M	Y	<	0.000200				
M	Er	<	0.000200	M	Mo	<	0.001202	O	Sc	<	0.000711	M	Yb	<	0.000200				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.38 +1 6 Tl(H2O)61+

Chemical Compatibility - Soluble in HCl, HNO3, and H2SO4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Tl Containing Samples)Preparation and Solution) -Metal (Best dissolved in HNO3 which forms chiefly the Tl1+ ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 205 amu	2 ppt	N/A	189Os16O
ICP-OES 190.864 nm	0.04 / 0.004 µg/mL	1	V, Ti
ICP-OES 276.787 nm	0.1 / 0.01 µg/mL	1	Ta, V, Fe, Cr
ICP-OES 351.924 nm	0.2 / 0.02 µg/mL	1	Th, Ce, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 08, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **February 08, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

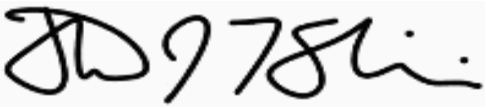
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCD10
Lot Number:	S2-CD710508
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Cadmium
Starting Material:	Cd Metal
Starting Material Lot#:	1953
Starting Material Purity:	99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10008 ± 30 µg/mL

Density: 1.029 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10010 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #2 **10011 ± 30 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 130116

Assay Method #3 **10003 ± 30 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Ag	<	0.003200	O	Eu	<	0.002500	O	Na		0.005499	M	Se	<	0.005700	O	Zn	<	0.001100
O	Al		0.008903	O	Fe		0.000602	M	Nb	<	0.000400	O	Si		0.016758	O	Zr	<	0.002600
M	As	<	0.003600	M	Ga	<	0.001200	M	Nd	<	0.000800	M	Sm	<	0.000400				
M	Au	<	0.000810	M	Gd	<	0.000400	M	Ni	<	0.003600	M	Sn	<	0.003200				
O	B		0.004189	O	Ge	<	0.012000	M	Os	<	0.000810	O	Sr	<	0.000330				
M	Ba	<	0.002400	M	Hf	<	0.000400	O	P	<	0.022000	M	Ta	<	0.000800				
M	Be	<	0.000400	M	Hg	<	0.001700	M	Pb	<	0.002400	M	Tb	<	0.000400				
M	Bi	<	0.000400	M	Ho	<	0.000400	M	Pd	<	0.001200	M	Te	<	0.008000				
O	Ca		0.011259	O	In	<	0.013000	M	Pr	<	0.000400	M	Th	<	0.000400				
s	Cd	<		M	Ir	<	0.000410	M	Pt	<	0.000400	O	Ti		0.000602				
M	Ce	<	0.000400	O	K		0.005237	M	Rb	<	0.004400	M	Tl		0.000523				
M	Co	<	0.000400	M	La	<	0.000400	M	Re	<	0.000400	M	Tm	<	0.000400				
O	Cr	<	0.005100	O	Li	<	0.000054	M	Rh	<	0.000400	M	U	<	0.000400				
M	Cs	<	0.002400	M	Lu	<	0.000400	M	Ru	<	0.002500	M	V	<	0.002000				
O	Cu	<	0.004800	O	Mg		0.000288	O	S	<	0.022000	M	W	<	0.000400				
M	Dy	<	0.000400	O	Mn	<	0.000860	O	Sb	<	0.018000	M	Y	<	0.000400				
M	Er	<	0.000400	M	Mo	<	0.001600	O	Sc	<	0.000430	M	Yb	<	0.000400				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd2(OH) (aq)3+ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 , and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3 / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (soluble in HCl or HNO3); Ores (dissolve in HCl /HNO3 then take to fumes with H2SO4. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 01, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 01, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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Christiansburg, VA 24073 USA
inorganicventures.com

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F: 540-585-3012
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMN10
Lot Number:	S2-MN704240
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Manganese
Starting Material:	Mn Metal
Starting Material Lot#:	2275
Starting Material Purity:	99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10011 ± 30 µg/mL

Density: 1.035 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9989 ± 69 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 050429

Assay Method #2 **10011 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10024 ± 47 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001500	M	Eu	<	0.000730	O	Na		0.176097	M	Se	<	0.006600	M	Zn		0.009925
O	Al		0.004322	M	Fe	<	0.650000	M	Nb	<	0.000730	O	Si		0.097654	M	Zr	<	0.000730
M	As	<	0.008000	M	Ga		0.004322	M	Nd	<	0.001500	M	Sm	<	0.000730				
M	Au	<	0.000730	M	Gd	<	0.000730	M	Ni		0.024013	M	Sn	<	0.002200				
M	B		0.068838	M	Ge	<	0.004400	M	Os	<	0.000730	O	Sr		0.000928				
M	Ba	<	0.001500	M	Hf	<	0.000730	i	P	<		M	Ta	<	0.000730				
M	Be	<	0.000730	M	Hg	<	0.002200	M	Pb		0.007364	M	Tb	<	0.000730				
M	Bi	<	0.003000	M	Ho	<	0.000730	M	Pd	<	0.000730	M	Te	<	0.019000				
O	Ca		0.062434	M	In	<	0.003000	M	Pr	<	0.000730	M	Th	<	0.000730				
M	Cd	<	0.001500	M	Ir	<	0.000730	M	Pt	<	0.000730	O	Ti	<	0.006500				
M	Ce	<	0.007300	O	K		0.006403	M	Rb	<	0.006600	M	Tl	<	0.000730				
O	Co		0.014728	M	La	<	0.003000	M	Re	<	0.000730	M	Tm	<	0.000730				
O	Cr		0.272151	O	Li		0.000416	M	Rh	<	0.003000	M	U	<	0.001500				
M	Cs	<	0.000730	M	Lu	<	0.000730	M	Ru	<	0.004400	M	V	<	0.000730				
O	Cu		0.007684	O	Mg		0.320177	i	S	<		M	W	<	0.004400				
M	Dy	<	0.001500	s	Mn	<		M	Sb	<	0.021000	O	Y		0.001360				
M	Er	<	0.001500	M	Mo		0.010245	O	Sc	<	0.004100	M	Yb	<	0.000730				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H2SO4 and heat to SO3 fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 17, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 17, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
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CERTIFICATE OF ANALYSIS

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGSB10
Lot Number:	R2-SB688559
Matrix:	3% (v/v) HNO3 3% (w/v) tartaric acid
Value / Analyte(s):	10 000 µg/mL ea: Antimony
Starting Material:	Antimony Metal
Starting Material Lot#:	1857
Starting Material Purity:	99.9894%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10003 ± 47 µg/mL

Density: 1.061 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10003 ± 41 µg/mL**
ICP Assay NIST SRM 3102a Lot Number: 140911

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$
w_i = the weighting factors for each method calculated using the inverse square of the variance:
$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2
$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method
u_{bb} = bottle to bottle homogeneity standard uncertainty
u_{lts} = long term stability standard uncertainty (storage)
u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with
$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2
$u_{char\ a}$ = the errors from characterization
u_{bb} = bottle to bottle homogeneity standard uncertainty
u_{lts} = long term stability standard uncertainty (storage)
u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000200	M	Eu	<	0.000300	O	Na		0.140000	M	Se	<	0.007300	O	Zn		0.005000
M	Al		0.003200	O	Fe		0.060000	M	Nb	<	0.000100	O	Si		0.150000	O	Zr	<	0.006300
M	As	<	0.004400	M	Ga	<	0.000400	M	Nd	<	0.000100	M	Sm	<	0.000100				
M	Au	<	0.000210	M	Gd	<	0.000100	O	Ni		0.004800	M	Sn	<	0.001800				
M	B	<	0.011000	M	Ge	<	0.000600	M	Os	<	0.000110	O	Sr		0.000750				
O	Ba	<	0.004900	M	Hf	<	0.000100	O	P		0.540000	M	Ta		0.003300				
M	Be	<	0.000400	M	Hg	<	0.000110	M	Pb	<	0.000400	M	Tb	<	0.000100				
M	Bi	<	0.000200	M	Ho	<	0.000100	M	Pd	<	0.000210	M	Te	<	0.000600				
O	Ca		0.110000	M	In	<	0.000100	M	Pr	<	0.001600	M	Th	<	0.000100				
M	Cd	<	0.000200	M	Ir	<	0.000110	M	Pt	<	0.000600	M	Ti	<	0.002800				
M	Ce		0.006500	O	K		0.020000	M	Rb	<	0.001000	M	Tl	<	0.000100				
M	Co	<	0.000200	O	La	<	0.016000	M	Re	<	0.000100	M	Tm	<	0.000100				
M	Cr		0.006900	O	Li	<	0.000430	M	Rh	<	0.000300	M	U	<	0.000100				
M	Cs	<	0.000200	M	Lu	<	0.000100	M	Ru	<	0.000310	M	V	<	0.000800				
M	Cu	<	0.000600	O	Mg		0.021000	n	S	<		M	W	<	0.000200				
M	Dy	<	0.000100	O	Mn		0.001900	s	Sb	<		M	Y	<	0.000100				
M	Er	<	0.000100	M	Mo	<	0.000500	O	Sc	<	0.002300	M	Yb	<	0.000100				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75 +3 6 Sb(O)C4H4O6-1

Chemical Compatibility -Stable in conc. HCl, dilute or conc. HF. Stable in dilute HNO3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO3 / LDPE container.

Sb Containing Samples (Preparation and Solution) -Metal and alloys (Soluble in H2O / HF / HNO3 mixture); Oxides (Soluble in HCl and tartaric acid or H2O / HF / HNO3 mixtures); Ores (fusion with Na2CO3 in Pt0 followed by dissolving the fuseate in a H2O / HF / HNO3 mixture); Organic based (sulfuric acid / hydrogen peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 121 amu	5 ppt	N/A	105Pd16O, 89Y16O2
ICP-OES 206.833 nm	0.03/0.003 µg/mL	1	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05/0.005 µg/mL	1	Nb, W, Re, Fe
ICP-OES 231.147 nm	0.06/0.006 µg/mL	1	Ni, Co, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 30, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 30, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAS10
Lot Number:	T2-AS718260
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Arsenic
Starting Material:	As Metal
Starting Material Lot#:	2208
Starting Material Purity:	99.9971%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10060 ± 40 µg/mL

Density: 1.037 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10062 ± 46 µg/mL**
ICP Assay NIST SRM 3103a Lot Number: 100818

Assay Method #2 **10055 ± 76 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.003200	M	Eu	<	0.000530	O	Na		0.032544	M	Se	<	0.006300	O	Zn		0.001952
M	Al		0.007593	O	Fe		0.001475	O	Nb	<	0.012000	O	Si		0.238658	O	Zr	<	0.004100
s	As	<		M	Ga	<	0.000530	M	Nd	<	0.000530	M	Sm	<	0.000530				
M	Au	<	0.003100	M	Gd	<	0.000530	M	Ni	<	0.002100	M	Sn	<	0.000530				
M	B		0.026035	M	Ge	<	0.001600	M	Os	<	0.000520	M	Sr	<	0.000530				
M	Ba	<	0.000530	M	Hf	<	0.000530	O	P	<	0.043000	M	Ta	<	0.000530				
O	Be	<	0.000360	M	Hg	<	0.001600	M	Pb	<	0.002100	M	Tb	<	0.000530				
M	Bi	<	0.000530	M	Ho	<	0.000530	M	Pd	<	0.001100	M	Te	<	0.004700				
O	Ca		0.004339	M	In	<	0.023000	M	Pr	<	0.005300	M	Th	<	0.000530				
M	Cd	<	0.001100	M	Ir	<	0.000520	M	Pt	<	0.000530	O	Ti	<	0.002300				
M	Ce	<	0.000530	O	K		0.002061	M	Rb	<	0.000530	M	Tl	<	0.000530				
M	Co	<	0.000530	M	La	<	0.001100	M	Re	<	0.000530	M	Tm	<	0.000530				
O	Cr	<	0.001800	O	Li	<	0.000120	M	Rh	<	0.000530	M	U	<	0.000530				
M	Cs	<	0.005300	M	Lu	<	0.000530	M	Ru	<	0.000520	M	V	<	0.002700				
M	Cu	<	0.001600	O	Mg		0.000154	O	S		0.028205	M	W	<	0.012000				
M	Dy	<	0.000530	O	Mn		0.000154	M	Sb	<	0.000530	M	Y	<	0.000530				
M	Er	<	0.000530	M	Mo	<	0.000530	O	Sc	<	0.001700	M	Yb	<	0.000530				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H3AsO4 and HAsO2

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO3,H3PO4, H2SO4 and HF aqueous matrices water and NH4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO3 / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H2O / HNO3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphic form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K2CO3 and KNO3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na2CO3 / Na2O2 mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37Cl,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 10, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 10, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

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CERTIFICATE OF ANALYSIS

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGBA10
Lot Number:	R2-BA692576
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Barium
Starting Material:	Barium Nitrate
Starting Material Lot#:	1969
Starting Material Purity:	99.9982%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10022 ± 30 µg/mL

Density: 1.025 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10018 ± 50 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 140909

Assay Method #2 **10023 ± 31 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #3 **10023 ± 30 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000410	O	Eu	<	0.005200	O	Na		0.004610	M	Se	<	0.003700	O	Zn		0.000658
M	Al	<	0.003100	O	Fe		0.015707	M	Nb	<	0.000210	O	Si		0.005573	M	Zr	<	0.001300
M	As	<	0.001300	M	Ga	<	0.000210	M	Nd	<	0.000210	O	Sm	<	0.021000				
M	Au	<	0.001300	M	Gd	<	0.000210	M	Ni	<	0.000810	M	Sn	<	0.000410				
O	B	<	0.005200	M	Ge	<	0.002500	M	Os	<	0.000410	O	Sr		0.003850				
s	Ba	<		M	Hf	<	0.000810	O	P	<	0.026000	M	Ta	<	0.000410				
O	Be	<	0.000320	M	Hg	<	0.000210	M	Pb	<	0.002300	M	Tb	<	0.000210				
M	Bi	<	0.000210	M	Ho	<	0.000210	M	Pd	<	0.000210	M	Te	<	0.001900				
O	Ca		0.007093	M	In	<	0.000210	M	Pr	<	0.000210	M	Th	<	0.000210				
M	Cd	<	0.000210	M	Ir	<	0.000210	M	Pt	<	0.000210	M	Ti	<	0.002100				
M	Ce	<	0.001300	O	K		0.035467	M	Rb	<	0.002100	M	Tl	<	0.000210				
M	Co	<	0.000410	O	La	<	0.005200	M	Re	<	0.000210	M	Tm	<	0.000410				
M	Cr	<	0.001700	O	Li	<	0.000630	M	Rh	<	0.000210	M	U	<	0.000210				
M	Cs	<	0.003300	M	Lu	<	0.001700	M	Ru	<	0.000210	O	V	<	0.005200				
M	Cu	<	0.001300	O	Mg		0.000861	O	S		0.268539	M	W	<	0.000410				
M	Dy	<	0.000210	M	Mn	<	0.000410	M	Sb	<	0.001300	O	Y	<	0.005200				
M	Er	<	0.001300	M	Mo	<	0.000410	M	Sc	<	0.000410	M	Yb	<	0.001300				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33 +2 6 Ba(H2O)6+2
Chemical Compatibility - Soluble in HCl, and HNO3. Avoid H2SO4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO3 / LDPE container.
Ba Containing Samples (Preparation and Solution) -Metal(is best dissolved in diluted HNO3); Ores(Carbonate fusion in Pt0 followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl / tartaric acid to prevent BaSO4 precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 138 amu	1 ppt	N/A	122Sn16O, 122Te16O
ICP-OES 230.424 nm	0.004/0.0005 µg/mL	1	Mo, Ir, Co
ICP-OES 233.527 nm	0.004/0.0003 µg/mL	1	
ICP-OES 455.403 nm	0.002/0.0001 µg/mL	1	Zr, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 11, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 11, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

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CERTIFICATE OF ANALYSIS

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGBE10
Lot Number:	R2-BE692992
Matrix:	6% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Beryllium
Starting Material:	Beryllium Acetate
Starting Material Lot#:	2281
Starting Material Purity:	99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10032 ± 41 µg/mL

Density: 1.128 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10042 ± 67 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 090514

Assay Method #2 **10025 ± 51 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001100	M	Eu	<	0.000270	O	Na		0.040962	M	Se	<	0.005000	M	Zn		0.013054
O	Al		0.016205	O	Fe		0.015754	M	Nb	<	0.000270	O	Si		0.024307	O	Zr	<	0.001900
M	As	<	0.002900	M	Ga	<	0.000270	M	Nd	<	0.000270	M	Sm	<	0.000270				
M	Au	<	0.000520	M	Gd	<	0.000270	M	Ni	<	0.003700	M	Sn	<	0.000790				
M	B	<	0.091000	M	Ge	<	0.000270	M	Os	<	0.000260	M	Sr		0.000630				
M	Ba		0.002700	M	Hf	<	0.000270	O	P	<	0.066000	M	Ta	<	0.000270				
s	Be	<		M	Hg	<	0.000520	M	Pb	<	0.000270	M	Tb	<	0.000270				
M	Bi	<	0.000530	M	Ho	<	0.000270	M	Pd	<	0.000520	M	Te	<	0.003700				
O	Ca		0.072022	M	In	<	0.000790	M	Pr	<	0.000270	M	Th	<	0.000270				
M	Cd	<	0.000790	M	Ir	<	0.000260	M	Pt	<	0.000270	O	Ti	<	0.000400				
M	Ce	<	0.000270	O	K		0.045014	M	Rb	<	0.000270	M	Tl	<	0.000790				
O	Co	<	0.003200	M	La	<	0.000270	M	Re	<	0.000270	M	Tm	<	0.000270				
O	Cr	<	0.001800	O	Li	<	0.000660	M	Rh	<	0.001100	M	U	<	0.000270				
M	Cs		0.001440	M	Lu	<	0.000270	M	Ru	<	0.000260	M	V	<	0.000790				
M	Cu	<	0.002100	O	Mg		0.016205	i	S	<		M	W	<	0.000530				
M	Dy	<	0.000270	M	Mn		0.001215	M	Sb	<	0.000270	M	Y	<	0.000270				
M	Er	<	0.000270	M	Mo	<	0.000530	O	Sc	<	0.000930	M	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01 +2 4 Be(H2O)4+2

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1 % HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO3 / LDPE container.

Be Containing Samples (Preparation and Solution) - Meta l(is best dissolved in diluted H2SO4); BeO (boiling nitric, hydrochloric, or sulfuric acids or KHSO4 fusion); Ores (H2SO4/HF digestion or carbonate fusion in Pt0); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 9 amu	4 ppt	N/A	
ICP-OES 234.861 nm	0.0003/0.00016 µg/mL	1	Fe, Ta, Mo
ICP-OES 313.042 nm	0.0003/0.00009 µg/mL	1	V, Ce, U
ICP-OES 313.107 nm	0.0007/0.0005 µg/mL	1	Ce, Th, Tm

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION, PERIOD OF VALIDITY AND REVISION HISTORY

11.1 Certification Issue Date

May 13, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 13, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

11.4 Revision Status

- Revision 1 - Revised on Thursday, Jan 14, 2021 by utruong. Revision was made for the following reason: Modified Section 7 Chemical Form in Solution.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCO10
Lot Number:	R2-CO695285
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Cobalt
Starting Material:	Co Metal
Starting Material Lot#:	2326
Starting Material Purity:	99.9934%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10012 ± 31 µg/mL

Density: 1.056 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10031 ± 67 µg/mL**
ICP Assay NIST SRM 3113 Lot Number: 190630

Assay Method #2 **10019 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10000 ± 35 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag		0.014660	M	Eu	<	0.000590	O	Na		0.007534	M	Se	<	0.019000	M	Zn		0.003461
M	Al	<	0.024000	M	Fe		0.050905	M	Nb	<	0.000590	O	Si		0.075340	M	Zr	<	0.001200
i	As	<		M	Ga	<	0.000590	M	Nd	<	0.000590	M	Sm	<	0.000590				
M	Au	<	0.004100	M	Gd	<	0.000590	O	Ni		0.427608	M	Sn	<	0.001200				
M	B	<	0.031000	M	Ge	<	0.003000	M	Os	<	0.000590	O	Sr	<	0.000260				
M	Ba	<	0.000590	M	Hf	<	0.000590	n	P	<		M	Ta	<	0.001200				
O	Be	<	0.001300	M	Hg	<	0.001800	M	Pb		0.003257	M	Tb	<	0.000590				
M	Bi	<	0.003000	M	Ho	<	0.000590	M	Pd	<	0.000590	M	Te	<	0.005300				
O	Ca		0.010588	M	In	<	0.001200	M	Pr	<	0.000590	M	Th	<	0.000590				
M	Cd	<	0.004700	M	Ir	<	0.001200	M	Pt	<	0.002400	M	Ti	<	0.014000				
M	Ce	<	0.000590	O	K		0.008144	M	Rb	<	0.000590	M	Tl		0.002647				
s	Co	<		M	La	<	0.000590	M	Re	<	0.000590	M	Tm	<	0.000590				
M	Cr	<	0.021000	O	Li	<	0.000130	M	Rh	<	0.000590	M	U	<	0.000590				
M	Cs	<	0.002400	M	Lu	<	0.000590	M	Ru	<	0.007100	O	V	<	0.000880				
M	Cu		0.189369	O	Mg		0.001893	n	S	<		M	W	<	0.000590				
M	Dy	<	0.000590	M	Mn	<	0.001800	M	Sb	<	0.003600	M	Y	<	0.000590				
M	Er	<	0.000590	M	Mo	<	0.002400	O	Sc	<	0.001600	M	Yb	<	0.000590				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 04, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 04, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAG10
Lot Number:	S2-AG712977
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Silver
Starting Material:	Ag Shot
Starting Material Lot#:	2289
Starting Material Purity:	99.9951%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10051 ± 30 µg/mL

Density: 1.056 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1	**10051 ± 52 µg/mL** ICP Assay NIST SRM 3151 Lot Number: 160729
Assay Method #2	**10051 ± 19 µg/mL** Volhard NIST SRM 999c Lot Number: 999c
Assay Method #3	**10049 ± 31 µg/mL** Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Ag	<		M	Eu	<	0.000260	O	Na		0.003811	M	Se	<	0.003900	O	Zn		0.048146
M	Al		0.002688	O	Fe		0.006419	M	Nb	<	0.000260	O	Si		0.005215	M	Zr	<	0.000260
M	As	<	0.001100	M	Ga	<	0.000260	M	Nd	<	0.000260	M	Sm	<	0.000260				
M	Au	<	0.000260	M	Gd	<	0.000260	O	Ni		0.001765	M	Sn		0.020060				
O	B	<	0.004300	M	Ge	<	0.002300	M	Os	<	0.001100	O	Sr	<	0.000110				
M	Ba	<	0.000520	M	Hf	<	0.000260	O	P	<	0.017000	M	Ta	<	0.000260				
O	Be	<	0.001100	M	Hg	<	0.000770	M	Pb	<	0.003600	M	Tb	<	0.000260				
M	Bi		0.004814	M	Ho	<	0.000260	M	Pd		0.044134	M	Te	<	0.009000				
O	Ca		0.005215	M	In		0.003691	M	Pr	<	0.000260	M	Th	<	0.000260				
M	Cd	<	0.000260	M	Ir	<	0.000520	M	Pt	<	0.001100	O	Ti	<	0.000440				
M	Ce	<	0.002100	O	K	<	0.008700	M	Rb	<	0.001100	M	Tl	<	0.004100				
O	Co	<	0.000330	M	La	<	0.000260	M	Re	<	0.000260	M	Tm	<	0.000260				
O	Cr	<	0.002500	O	Li	<	0.000110	M	Rh	<	0.000520	M	U	<	0.000260				
M	Cs	<	0.002600	M	Lu	<	0.000260	M	Ru	<	0.000260	M	V	<	0.000260				
O	Cu		0.357085	O	Mg		0.001203	O	S	<	0.017000	M	W	<	0.000260				
M	Dy	<	0.000260	O	Mn	<	0.000220	M	Sb	<	0.014000	M	Y	<	0.000260				
M	Er	<	0.000260	M	Mo	<	0.000260	O	Sc	<	0.000220	M	Yb	<	0.000260				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 $Ag(H_2O)_6^+$

Chemical Compatibility -Stable in HNO_3, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [$AgCl_{x1-x}$] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite , bromide, chloride, iodide, carbonate , chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Ag Containing Samples (Preparation and Solution) -Metal (Soluble in HNO_3); Oxides (Soluble in HNO_3); Ores (Digestion with conc. HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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F: 540-585-3012
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCR(3)10
Lot Number:	S2-CR709784
Matrix:	10% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Chromium
Starting Material:	Cr Metal
Starting Material Lot#:	2328
Starting Material Purity:	99.9951%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10027 ± 41 µg/mL

Density: 1.072 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10027 ± 40 µg/mL**
ICP Assay NIST SRM 3112a Lot Number: 170630

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001700	M	Eu	<	0.003400	O	Na		0.090372	M	Se	<	0.012000	O	Zn	<	0.006100
M	Al		0.034916	O	Fe		0.246471	M	Nb	<	0.017000	n	Si	<		M	Zr	<	0.007800
M	As	<	0.028000	O	Ga	<	0.013000	M	Nd	<	0.013000	M	Sm	<	0.006900				
M	Au	<	0.001700	M	Gd	<	0.000560	M	Ni		0.016020	M	Sn		0.006983				
O	B	<	0.025000	O	Ge	<	0.014000	M	Os	<	0.000560	M	Sr		0.006367				
M	Ba	<	0.008900	M	Hf	<	0.000560	i	P	<		M	Ta	<	0.000560				
M	Be	<	0.013000	M	Hg	<	0.001700	M	Pb		0.010064	M	Tb	<	0.000560				
M	Bi	<	0.002300	M	Ho	<	0.000560	M	Pd	<	0.021000	M	Te	<	0.010000				
O	Ca		0.075995	M	In	<	0.000560	M	Pr	<	0.001700	M	Th	<	0.000560				
M	Cd	<	0.000560	M	Ir	<	0.000560	M	Pt	<	0.001200	O	Ti		0.013555				
M	Ce	<	0.001200	O	K		0.043132	i	Rb	<		M	Tl	<	0.000560				
M	Co	<	0.002600	M	La	<	0.001200	M	Re	<	0.001200	O	Tm	<	0.013000				
s	Cr	<		O	Li		0.000390	M	Rh	<	0.095000	M	U	<	0.000560				
M	Cs	<	0.007800	M	Lu	<	0.000560	M	Ru	<	0.087000	O	V		0.014993				
O	Cu		0.007599	O	Mg		0.000883	i	S	<		M	W	<	0.049000				
M	Dy	<	0.000560	M	Mn		0.008626	M	Sb	<	0.003400	M	Y	<	0.001700				
M	Er	<	0.019000	M	Mo	<	0.032000	M	Sc		0.003080	M	Yb	<	0.000560				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 $Cr(H_2O)_6^{3+}$

Chemical Compatibility -Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cr3 Containing Samples (Preparation and Solution) -Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1. B. Fusion with $NaKSO_4$ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, <, C); Organic Matrices (ash at 4500C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S16O, 36Ar16O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 26, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **October 26, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGNI10
Lot Number:	P2-NI686384
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Nickel
Starting Material:	Ni Metal
Starting Material Lot#:	2277 and 2282
Starting Material Purity:	99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL

Density: 1.038 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9971 ± 54 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 120619

Assay Method #2 **9970 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **9993 ± 33 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag		0.002606	M	Eu	<	0.001100	O	Na		0.004965	O	Se	<	0.067000	M	Zn		0.006578
M	Al	<	0.013000	O	Fe		0.018618	M	Nb	<	0.001100	O	Si		0.010923	M	Zr	<	0.001100
O	As	<	0.067000	M	Ga	<	0.001100	M	Nd	<	0.001100	M	Sm	<	0.001100				
M	Au	<	0.002100	M	Gd	<	0.001100	s	Ni	<		M	Sn	<	0.016000				
M	B	<	0.017000	M	Ge	<	0.004200	M	Os		0.002110	O	Sr	<	0.000940				
M	Ba	<	0.001100	M	Hf	<	0.001100	i	P	<		M	Ta	<	0.001100				
O	Be	<	0.000410	M	Hg		0.014895	M	Pb		0.006578	M	Tb	<	0.001100				
M	Bi	<	0.004200	M	Ho	<	0.001100	M	Pd	<	0.001100	M	Te	<	0.015000				
O	Ca		0.003351	M	In	<	0.001100	M	Pr	<	0.001100	M	Th	<	0.001100				
M	Cd		0.001365	M	Ir		0.004716	M	Pt	<	0.001100	M	Ti	<	0.004200				
M	Ce	<	0.001100	O	K		0.004716	M	Rb	<	0.001100	M	Tl	<	0.001100				
O	Co		0.017377	M	La	<	0.001100	M	Re		0.001737	M	Tm	<	0.001100				
O	Cr	<	0.006700	O	Li	<	0.000140	M	Rh	<	0.006300	M	U	<	0.001100				
M	Cs	<	0.007300	M	Lu	<	0.001100	M	Ru	<	0.019000	M	V	<	0.002100				
M	Cu		0.004096	O	Mg		0.000372	i	S	<		M	W	<	0.006300				
M	Dy	<	0.001100	O	Mn	<	0.001900	M	Sb		0.005833	O	Y	<	0.000540				
M	Er	<	0.001100	M	Mo	<	0.008400	M	Sc	<	0.002100	M	Yb	<	0.001100				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 02, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGV10
Lot Number:	S2-V711005
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Vanadium
Starting Material:	Vanadium Pentoxide
Starting Material Lot#:	1782
Starting Material Purity:	99.9877%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10014 ± 30 µg/mL

Density: 1.104 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10017 ± 42 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 160906

Assay Method #2 **10013 ± 30 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000110	M	Eu	<	0.000110	O	Na		0.120000	M	Se	<	0.009400	M	Zn		0.009400
O	Al		0.120000	O	Fe		0.460000	M	Nb	<	0.001300	O	Si		0.270000	M	Zr	<	0.002900
M	As	<	0.000210	M	Ga	<	0.009300	M	Nd	<	0.000610	M	Sm	<	0.000110				
M	Au	<	0.004700	M	Gd	<	0.000110	M	Ni		0.012000	M	Sn		0.003900				
M	B		0.051000	M	Ge	<	0.000410	M	Os	<	0.000110	O	Sr		0.007100				
M	Ba		0.003600	M	Hf	<	0.000110	O	P	<	0.034000	M	Ta	<	0.000110				
O	Be	<	0.000560	M	Hg	<	0.000410	M	Pb		0.001400	M	Tb	<	0.000110				
M	Bi	<	0.000210	M	Ho	<	0.000110	M	Pd	<	0.000410	M	Te	<	0.000110				
O	Ca		0.730000	M	In	<	0.000110	M	Pr	<	0.000110	M	Th	<	0.000210				
M	Cd	<	0.000610	M	Ir	<	0.000110	M	Pt	<	0.000110	M	Ti		0.017000				
M	Ce	<	0.000610	M	K		0.052000	M	Rb	<	0.000310	M	Tl	<	0.000110				
M	Co	<	0.001300	M	La	<	0.000410	M	Re		0.001700	M	Tm	<	0.000110				
O	Cr		0.170000	M	Li	<	0.000810	M	Rh	<	0.000110	M	U	<	0.000410				
M	Cs		0.005600	M	Lu	<	0.000110	M	Ru	<	0.000110	s	V	<					
M	Cu	<	0.001300	M	Mg		0.053000	i	S	<		M	W		0.002000				
M	Dy	<	0.000110	M	Mn		0.007900	M	Sb		0.078000	M	Y	<	0.000110				
M	Er	<	0.000110	M	Mo		0.094000	M	Sc	<	0.000410	M	Yb	<	0.000110				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.94 +5 6 $H_2V_{10}O_{28}^{4-}$

Chemical Compatibility -Soluble in HCl, HNO_3, H_2SO_4, HF, H_3PO_4 and strong basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

V Containing Samples (Preparation and Solution) -Metal (Fusion with NaOH or KOH in Ni0 or Na_2CO_3 / KNO_3); Oxides (V_2O_3 - use HCl, V_2O_4 - use HCl or HNO_3, V_2O_5 - use concentrated acids); Ores (Na_2CO_3 / KNO_3 in Pt0 caution - nitrates attack Pto followed by water extraction of fuseate); Organic Matrices (Ash at 450 EC followed by dissolving according to V_2O_5 above) .

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 51 amu	4 ppt	N/A	34S16O1H, 35Cl16O, 38Ar13C, 36Ar15N, 36Ar14N1H, 37Cl14N,36S15N, 33S18O, 34S17O, 102Ru+2,02Pd+2
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	Hf, Nb
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	Th
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	Mg, U, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAL10
Lot Number:	T2-AL716102
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Aluminum
Starting Material:	Aluminum Nitrate Nonahydrate
Starting Material Lot#:	2460
Starting Material Purity:	99.9938%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10049 ± 31 µg/mL

Density: 1.087 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10059 ± 40 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 140903

Assay Method #2 **10044 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10049 ± 35 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002100	M	Eu	<	0.002100	O	Na		0.352819	M	Se	<	0.005200	M	Zn		0.006018
s	Al	<		O	Fe		0.074714	M	Nb	<	0.000520	O	Si		0.017848	O	Zr		0.004358
M	As		0.008716	O	Ga		0.112072	M	Nd	<	0.000520	M	Sm	<	0.000520				
M	Au	<	0.008400	M	Gd	<	0.001100	O	Ni	<	0.006000	M	Sn		0.000747				
O	B	<	0.014000	M	Ge	<	0.005200	M	Os	<	0.000650	O	Sr		0.000518				
O	Ba		0.012867	M	Hf	<	0.004100	n	P	<		M	Ta	<	0.000520				
O	Be	<	0.000270	M	Hg	<	0.002000	M	Pb		0.002282	M	Tb	<	0.000520				
M	Bi		0.001930	M	Ho	<	0.000520	M	Pd	<	0.000520	M	Te	<	0.001100				
O	Ca		0.076790	M	In	<	0.002100	M	Pr	<	0.000520	M	Th	<	0.000520				
M	Cd	<	0.000520	M	Ir	<	0.000650	M	Pt	<	0.000520	O	Ti		0.001930				
M	Ce	<	0.001100	O	K		0.043583	M	Rb	<	0.000520	M	Tl	<	0.000520				
O	Co	<	0.005400	M	La	<	0.002100	M	Re	<	0.000520	M	Tm	<	0.000520				
O	Cr		0.006018	O	Li		0.000112	M	Rh	<	0.000520	M	U	<	0.000520				
M	Cs		0.000643	M	Lu	<	0.000520	M	Ru	<	0.002000	M	V		0.001286				
O	Cu	<	0.008300	O	Mg		0.068488	i	S	<		M	W	<	0.009800				
M	Dy	<	0.002100	O	Mn		0.000913	M	Sb	<	0.003100	M	Y	<	0.001100				
M	Er	<	0.000520	M	Mo		0.005396	O	Sc	<	0.000950	M	Yb	<	0.000520				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98 +3 6 Al(H2O)6+3

Chemical Compatibility -Soluble in HCl, HNO3, v F and v 2SO4. Avoid neutral media. Soluble in strongly basic NaOH forming the Al(OH)4(H2O)21- species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Al Containing Samples (Preparation and Solution) -Metal (Best dissolved in HCl / HNO3); a- Al2O3 (Na2CO3 fusion in Pt0);

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 27 amu	30 ppt	N/A	12C15N, 13C14N, 1H12C14N, 11B16O, 54Cr2+, 54Fe2+
ICP-OES 167.078 nm	0.1/0.009 µg/mL	1	Fe
ICP-OES 394.401 nm	0.05/0.006 µg/mL	1	U, Ce
ICP-OES 396.152 nm	0.03/0.006 µg/mL	1	Mo, Zr, Ce

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 22, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 22, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGK10
Lot Number:	S2-K711973
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Potassium
Starting Material:	KNO3
Starting Material Lot#:	2313
Starting Material Purity:	99.9971%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 30 µg/mL

Density: 1.024 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9987 ± 24 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10004 ± 84 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 140813

Assay Method #3 **10007 ± 45 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001400	M	Eu	<	0.000660	O	Na		0.246220	M	Se	<	0.007900	O	Zn		0.018056
O	Al		0.001592	O	Fe		0.005909	M	Nb	<	0.000660	O	Si		0.011490	O	Zr	<	0.001600
M	As	<	0.005300	M	Ga	<	0.000660	M	Nd	<	0.000660	M	Sm	<	0.000660				
M	Au	<	0.002000	M	Gd	<	0.000660	O	Ni	<	0.004900	M	Sn	<	0.000660				
O	B	<	0.005600	M	Ge	<	0.002000	M	Os	<	0.003300	O	Sr		0.000055				
O	Ba	<	0.000860	M	Hf	<	0.000660	O	P	<	0.032000	M	Ta	<	0.000660				
O	Be	<	0.000082	M	Hg	<	0.002000	M	Pb	<	0.002300	M	Tb	<	0.000660				
M	Bi	<	0.006600	M	Ho	<	0.000660	M	Pd	<	0.000660	M	Te	<	0.017000				
O	Ca		0.031187	M	In	<	0.000660	M	Pr	<	0.000660	M	Th	<	0.000660				
O	Cd	<	0.000450	M	Ir	<	0.000660	M	Pt	<	0.002700	M	Ti	<	0.000660				
M	Ce	<	0.000660	s	K	<		M	Rb		0.476026	M	Tl	<	0.000660				
O	Co	<	0.000780	M	La	<	0.000660	M	Re	<	0.000660	M	Tm	<	0.000660				
O	Cr		0.000541	O	Li	<	0.000084	M	Rh	<	0.000660	M	U	<	0.000660				
M	Cs	<	0.000660	M	Lu	<	0.000660	M	Ru	<	0.000660	O	V	<	0.001100				
M	Cu	<	0.002700	O	Mg		0.006237	O	S		0.027905	M	W	<	0.000660				
M	Dy	<	0.000660	O	Mn		0.000476	M	Sb	<	0.000660	M	Y	<	0.000660				
M	Er	<	0.000660	M	Mo	<	0.000660	O	Sc	<	0.000340	O	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 39.10 +1 (6) K+(aq)

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Avoid use of HClO4 due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO4-.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt0 followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 39 amu	10 ppt	n/a	38ArH, 23Na16O, 78Se
ICP-OES 404.721 nm	1.1 / 0.05 µg/mL	1	U, Ce
ICP-OES 766.490 nm	0.4 / 0.001 µg/mL	1	2nd order radiation from R.E.s on some optical designs
ICP-OES 771.531 nm	1.0 / 0.03 µg/mL	1	2nd order radiation from R.E.s on some optical designs

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 10, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 10, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMG10
Lot Number:	S2-MG704239
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Magnesium
Starting Material:	Magnesium Metal
Starting Material Lot#:	2168
Starting Material Purity:	99.9984%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10053 ± 30 µg/mL

Density: 1.053 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10022 ± 62 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 140110

Assay Method #2 **10078 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10033 ± 26 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Ag		0.002106	M	Eu	<	0.000910	O	Na		0.071075	O	Se	<	0.048000	O	Zn		0.003299
M	Al		0.003553	M	Fe		0.002538	M	Nb	<	0.000460	O	Si	<	0.032000	O	Zr	<	0.002700
M	As	<	0.001400	M	Ga	<	0.000460	M	Nd	<	0.000910	M	Sm	<	0.000460				
M	Au	<	0.001400	M	Gd	<	0.000460	O	Ni	<	0.001600	M	Sn	<	0.002300				
O	B		0.006853	M	Ge	<	0.001400	M	Os	<	0.000460	O	Sr		0.000279				
O	Ba		0.000964	M	Hf	<	0.000460	O	P		0.015230	M	Ta	<	0.000460				
O	Be	<	0.000120	M	Hg	<	0.000460	M	Pb	<	0.000460	M	Tb	<	0.000460				
M	Bi	<	0.000460	M	Ho	<	0.000460	M	Pd	<	0.003200	M	Te	<	0.007300				
O	Ca		0.053306	M	In	<	0.000460	M	Pr	<	0.000460	M	Th	<	0.000460				
O	Cd	<	0.000360	M	Ir	<	0.000460	M	Pt	<	0.001900	O	Ti	<	0.001700				
M	Ce	<	0.002300	M	K		0.048229	M	Rb		0.002411	M	Tl		0.003046				
M	Co	<	0.000910	M	La	<	0.002800	M	Re	<	0.000460	M	Tm	<	0.000460				
M	Cr	<	0.002300	O	Li		0.027922	M	Rh	<	0.000460	M	U	<	0.000460				
M	Cs		0.001040	M	Lu	<	0.000460	M	Ru	<	0.000460	M	V	<	0.000460				
O	Cu	<	0.003000	s	Mg	<		O	S	<	0.190000	M	W	<	0.000460				
M	Dy	<	0.000460	O	Mn		0.015230	M	Sb		0.020814	O	Y	<	0.000720				
M	Er	<	0.000460	M	Mo	<	0.000910	O	Sc	<	0.000480	M	Yb	<	0.000460				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.31 +2 6 Mg(H2O)6+2

Chemical Compatibility -Soluble in HCl, HNO3, and H2SO4 avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO3 / LDPE container.

Mg Containing Samples (Preparation and Solution) -Metal (Best dissolved in diluted HNO3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 24 amu	42 ppt	n/a	7Li17O, 48Ti+2 , 48Ca+2
ICP-OES 279.553 nm	0.0002 / 0.00003 µg/mL	1	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 µg/mL	1	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 µg/mL	1	U, Hf, Cr, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 23, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 23, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

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ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCA10
Lot Number:	T2-CA716103
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Calcium
Starting Material:	CaCO3
Starting Material Lot#:	2472
Starting Material Purity:	99.9950%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10005 ± 30 µg/mL

Density: 1.039 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10005 ± 45 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 130213

Assay Method #2 **10005 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10005 ± 31 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001200	M	Eu	<	0.001200	O	Na		0.006112	M	Se	<	0.024000	M	Zn		0.005362
M	Al		0.065419	O	Fe		0.009115	M	Nb	<	0.001200	O	Si		0.139417	O	Zr	<	0.006700
O	As	<	0.013000	M	Ga	<	0.015000	M	Nd	<	0.020000	M	Sm	<	0.001200				
M	Au	<	0.017000	M	Gd	<	0.004800	O	Ni		0.000793	M	Sn	<	0.003600				
O	B		0.001179	M	Ge	<	0.003600	M	Os	<	0.001200	M	Sr		0.081505				
O	Ba		0.002788	M	Hf	<	0.001200	O	P	<	0.041000	M	Ta	<	0.001200				
O	Be	<	0.000410	M	Hg	<	0.004800	M	Pb		0.001608	M	Tb	<	0.001200				
M	Bi		0.001608	M	Ho	<	0.001200	M	Pd	<	0.001200	M	Te	<	0.003600				
s	Ca	<		M	In	<	0.001200	M	Pr		0.000257	M	Th	<	0.001200				
O	Cd	<	0.001300	M	Ir	<	0.001200	M	Pt	<	0.003600	O	Ti	<	0.001900				
M	Ce		0.001029	O	K		0.009759	M	Rb	<	0.001200	M	Tl	<	0.001200				
O	Co		0.000418	M	La		0.001823	M	Re	<	0.001200	M	Tm	<	0.001200				
O	Cr		0.003324	O	Li	<	0.007300	M	Rh	<	0.001200	M	U		0.002144				
M	Cs		0.007399	M	Lu		0.000128	M	Ru	<	0.001200	M	V		0.001286				
O	Cu	<	0.011000	M	Mg		1.286934	O	S		0.055767	O	W	<	0.024000				
M	Dy	<	0.002400	O	Mn		0.004611	M	Sb	<	0.009600	O	Y		0.000536				
M	Er	<	0.002400	M	Mo		0.003539	O	Sc	<	0.001400	M	Yb	<	0.001200				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.08 +2 6 Ca(H2O)6+2

Chemical Compatibility - Soluble in HCl and HNO3. Avoid H2SO4, v F, v 3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO3 / LDPE container.

Ca Containing Samples)Preparation and Solution) -Metal (best dissolved in diluted HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO2). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO3. The sulfates (gypsum, anhydrite, etc.), certain silicates, and complex compounds require fusion with Na2CO3 followed by HCl / water dissolution. Note that contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 44 amu	1200 ppt	n/a	16O212C, 28Si16O, 88Sr
ICP-OES 393.366 nm	0.0002 / 0.00004 µg/mL	1	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 µg/mL	1	Th
ICP-OES 422.673 nm	0.01 / 0.001 µg/mL	1	Ge

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 14, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 14, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

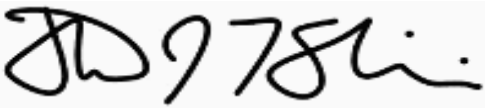
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGNA10
Lot Number:	T2-NA717221
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Sodium
Starting Material:	Na2CO3
Starting Material Lot#:	2358 and 2453
Starting Material Purity:	99.9977%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9977 ± 30 µg/mL

Density: 1.033 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9974 ± 18 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **9977 ± 34 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 200413

Assay Method #3 **9987 ± 31 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000930	M	Eu	<	0.000930	s	Na	<		M	Se	<	0.003800	O	Zn		0.000138
M	Al		0.004409	O	Fe		0.002393	M	Nb	<	0.000930	O	Si		0.056696	O	Zr	<	0.003200
O	As	<	0.023000	M	Ga	<	0.000930	M	Nd	<	0.000930	M	Sm	<	0.000930				
O	Au	<	0.004100	M	Gd	<	0.000930	O	Ni	<	0.003000	M	Sn	<	0.002800				
O	B		0.001385	M	Ge	<	0.004700	M	Os	<	0.000930	O	Sr		0.000251				
M	Ba		0.004031	M	Hf	<	0.000930	O	P		0.010205	M	Ta	<	0.000930				
O	Be	<	0.000130	M	Hg	<	0.000930	M	Pb	<	0.000930	M	Tb	<	0.000930				
M	Bi	<	0.000930	M	Ho	<	0.000930	M	Pd	<	0.000930	M	Te	<	0.001900				
O	Ca		0.176388	M	In	<	0.000930	M	Pr	<	0.000930	M	Th		0.000352				
O	Cd	<	0.000860	M	Ir	<	0.000930	M	Pt	<	0.000930	O	Ti		0.000592				
M	Ce	<	0.001900	O	K		0.302380	M	Rb	<	0.000930	M	Tl	<	0.000930				
O	Co	<	0.001800	O	La	<	0.002100	M	Re	<	0.000930	M	Tm	<	0.000930				
M	Cr	<	0.002800	O	Li		0.000031	M	Rh	<	0.000930	M	U	<	0.000930				
M	Cs	<	0.000930	M	Lu	<	0.000930	M	Ru	<	0.001900	O	V	<	0.001600				
O	Cu	<	0.003900	O	Mg		0.026458	O	S		0.040317	O	W	<	0.028000				
M	Dy	<	0.000930	O	Mn	<	0.000740	M	Sb	<	0.000930	O	Y	<	0.000860				
M	Er	<	0.000930	O	Mo	<	0.003600	O	Sc	<	0.000610	O	Yb	<	0.000250				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.99 +1 (6) Na+(aq) largely ionic in nature

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 23 amu	310 ppt	n/a	46Ti+2 , 46Ca+2
ICP-OES 330.237 nm	2.0 / 0.09 µg/mL	1	Pd, Zn
ICP-OES 588.995 nm	0.03 / 0.006 µg/mL	1	2nd order radiation from R.E.s on some optical designs
ICP-OES 589.595 nm	0.07 / 0.00009 µg/mL	1	2nd order radiation from R.E.s on some optical designs

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 20, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 20, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGU1
Lot Number:	S2-U707914
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	1 000 µg/mL ea: Uranium
Starting Material:	Uranyl Nitrate Hexahydrate
Starting Material Lot#:	P2-2322
Starting Material Purity:	99.9997%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 999 ± 5 µg/mL

Density: 1.010 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **998 ± 5 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 080521

Assay Method #2 **1001 ± 6 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.19 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000270	M	Eu	<	0.000270	M	Na	<	0.011000	M	Se	<	0.009300	M	Zn		0.002358
M	Al	<	0.011000	M	Fe		0.003222	M	Nb	<	0.000270	M	Si	<	0.160000	M	Zr	<	0.001100
M	As	<	0.002400	M	Ga	<	0.000270	M	Nd	<	0.000270	M	Sm	<	0.000270				
M	Au	<	0.000270	M	Gd	<	0.000270	M	Ni	<	0.020000	M	Sn	<	0.011000				
M	B	<	0.000270	M	Ge	<	0.000800	M	Os	<	0.001900	M	Sr	<	0.000270				
M	Ba	<	0.003800	M	Hf	<	0.000270	i	P	<		M	Ta	<	0.000270				
M	Be	<	0.000270	M	Hg	<	0.000540	M	Pb	<	0.002200	M	Tb	<	0.000270				
M	Bi	<	0.000270	M	Ho	<	0.000270	M	Pd	<	0.000540	M	Te	<	0.003800				
M	Ca	<	0.140000	M	In	<	0.000270	M	Pr	<	0.000270	M	Th		0.000129				
M	Cd	<	0.000270	M	Ir	<	0.000270	M	Pt	<	0.000270	M	Ti	<	0.002700				
M	Ce	<	0.000540	O	K	<	0.250000	M	Rb	<	0.000800	M	Tl	<	0.000270				
M	Co	<	0.000800	M	La		0.000117	M	Re	<	0.064000	M	Tm	<	0.000270				
M	Cr		0.000943	M	Li	<	0.003000	M	Rh	<	0.000270	s	U	<					
M	Cs		0.000106	M	Lu	<	0.000270	M	Ru	<	0.000540	M	V	<	0.000540				
M	Cu	<	0.001100	M	Mg	<	0.003000	i	S	<		M	W	<	0.000540				
M	Dy	<	0.000270	M	Mn	<	0.006900	M	Sb	<	0.000270	M	Y	<	0.000270				
M	Er	<	0.000270	M	Mo	<	0.006400	M	Sc	<	0.000540	M	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.03 +6 8 UO22+(uranyl)

Chemical Compatibility - Soluble in HCl and HNO3. Avoid H3PO4. H2SO4 and HF matrices should not be a problem depending upon [U]. Although the UO22+ ion is distinctly basic, any U+4 will precipitate in basic media. UO22+salts are generally soluble in water and UO22+ is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF4 and UF6 are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

U Containing Samples (Preparation and Solution) -Metal (Dissolves rapidly in HCl and HNO3); Oxide (Soluble in HNO3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H2SO4.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 238 amu	2 ppt	N/A	206Pb16O2
ICP-OES 263.553 nm	0.3 / 0.01 µg/mL	1	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-OES 367.007 nm	0.3 / 0.02 µg/mL	1	Th, Ce
ICP-OES 385.958 nm	0.3 / 0.01 µg/mL	1	Th, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	AR-ICVMS-2
Lot Number:	T2-MEB719895
Matrix:	3% (v/v) HNO3 tr. HF
Value / Analyte(s):	2.5 µg/mL ea: Molybdenum, Antimony

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Antimony, Sb	**2.499 ± 0.015 µg/mL**	**Molybdenum, Mo**	**2.500 ± 0.017 µg/mL**

Density: 1.014 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Mo	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
Sb	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 06, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 06, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	AR-ICVMS-3
Lot Number:	T2-MEB719896
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	250 µg/mL ea: Aluminum, Calcium, Iron, Potassium, Magnesium, Sodium, 4 µg/mL ea: Selenium, 2.5 µg/mL ea: Thorium, Thallium, Uranium, Vanadium, Zinc, Manganese, Cadmium, Cobalt, Chromium, Copper, Arsenic, Barium, Beryllium, Nickel, Lead, Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	250.0 ± 0.9 µg/mL	Arsenic, As	2.500 ± 0.018 µg/mL
Barium, Ba	2.501 ± 0.013 µg/mL	Beryllium, Be	2.501 ± 0.015 µg/mL
Cadmium, Cd	2.501 ± 0.013 µg/mL	Calcium, Ca	250.0 ± 1.3 µg/mL
Chromium, Cr	2.500 ± 0.015 µg/mL	Cobalt, Co	2.500 ± 0.014 µg/mL
Copper, Cu	2.500 ± 0.014 µg/mL	Iron, Fe	250.0 ± 1.0 µg/mL
Lead, Pb	2.500 ± 0.013 µg/mL	Magnesium, Mg	250.0 ± 1.3 µg/mL
Manganese, Mn	2.500 ± 0.014 µg/mL	Nickel, Ni	2.500 ± 0.014 µg/mL
Potassium, K	250.0 ± 1.2 µg/mL	Selenium, Se	4.002 ± 0.024 µg/mL
Silver, Ag	2.501 ± 0.017 µg/mL	Sodium, Na	250.0 ± 1.2 µg/mL
Thallium, Tl	2.500 ± 0.017 µg/mL	Thorium, Th	2.499 ± 0.013 µg/mL
Uranium, U	2.501 ± 0.015 µg/mL	Vanadium, V	2.500 ± 0.014 µg/mL
Zinc, Zn	2.500 ± 0.014 µg/mL		

Density: 1.042 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
Ba	ICP Assay	3104a	140909
Ba	Calculated		See Sec. 4.2
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Cu	Calculated		See Sec. 4.2
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Mn	Calculated		See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
Se	ICP Assay	3149	100901
Se	Calculated		See Sec. 4.2
Th	EDTA	928	928
Th	Calculated		See Sec. 4.2
Tl	ICP Assay	3158	151215
Tl	Calculated		See Sec. 4.2
U	ICP Assay	3164	080521
U	Calculated		See Sec. 4.2

V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
Zn	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.19 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information.

https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 06, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 06, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

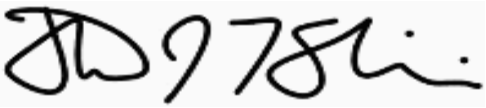
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

ERA
A Waters Company

Certified Reference Material

▪ Certificate of Analysis ▪

Product: Metals in Soil
Catalog Number: 540
Lot No. D120-540
Certificate Issue Date: December 16, 2022
Expiration Date: April 01, 2026
Revision Number: Original

L 000950

Product use instructions are included as part of the certification packet and are paginated separately from this Certificate of Analysis. Please reference the product use instructions for catalog #540 revision 111122.

CERTIFICATION

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Aluminum	9420	5640	2.77	1720 - 9560	2550 - 10400
Antimony	225	97.9	31.4	D.L. - 211	22.5 - 251
Arsenic	66.6	73.9	3.11	63.4 - 84.5	51.8 - 96.1
Barium	354	311	3.79	253 - 370	234 - 389
Beryllium	108	92.9	3.20	75.8 - 110	69.7 - 119
Boron	102	56.1	6.31	33.7 - 78.4	33.6 - 112
Cadmium	91.8	75.4	17.5	61.0 - 89.8	56.6 - 101
Calcium	2640	2580	2.84	2140 - 3030	1760 - 3410
Chromium	137	116	4.95	93.1 - 139	81.3 - 151
Cobalt	137	118	7.94	96.3 - 139	88.2 - 151
Copper	139	114	12.1	92.9 - 136	85.8 - 153
Iron	7100	6160	2.51	3500 - 8810	710 - 12700
Lead	247	212	4.43	170 - 253	156 - 272
Lithium	8.14	5.11	5.23	2.35 - 7.87	0.814 - 10.8
Magnesium	1560	1350	3.92	1010 - 1690	668 - 2030
Manganese	286	255	3.26	205 - 304	187 - 322
Mercury	14.9	15.1	7.72	11.1 - 19.1	9.09 - 21.2
Molybdenum	47.5	49.1	36.3	40.7 - 57.5	33.3 - 64.9
Nickel	295	252	69.7	204 - 299	176 - 327
Potassium	1800	1620	3.33	1170 - 2080	898 - 2340
Selenium	93.6	75.1	24.9	57.3 - 93.0	47.2 - 103
Silver	80.6	65.7	38.8	50.4 - 81.0	46.4 - 88.7
Sodium	232	244	3.54	189 - 299	122 - 365
Strontium	133	94.9	3.96	70.8 - 119	68.1 - 146

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Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Thallium	158	129	21.1	101 - 157	89.5 - 174
Tin	113	89.6	23.1	67.4 - 112	49.9 - 129
Titanium	145	126	8.56	39.3 - 213	0.00 - 268
Uranium	48.2	40.8	3.84	29.4 - 52.3	28.4 - 53.2
Vanadium	116	96.1	6.62	73.6 - 119	64.2 - 128
Zinc	184	156	3.83	123 - 189	109 - 203

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ERA
A Waters Company

Certified Reference Material

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ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number[6]	Recovery
	mg/kg	mg/kg	%			%
Aluminum	9420	5640	59.9	101	-	-
Antimony	225	97.9	43.5	106	-	-
Arsenic	66.6	73.9	111	141	-	-
Barium	354	311	88.0	127	-	-
Beryllium	108	92.9	86.0	119	-	-
Boron	102	56.1	55.0	80	-	-
Cadmium	91.8	75.4	82.1	160	-	-
Calcium	2640	2580	97.9	102	-	-
Chromium	137	116	84.8	141	-	-
Cobalt	137	118	85.8	112	-	-
Copper	139	114	82.3	151	-	-
Iron	7100	6160	86.7	105	-	-
Lead	247	212	85.7	170	-	-
Lithium	8.14	5.11	62.8	14	-	-
Magnesium	1560	1350	86.4	102	-	-
Manganese	286	255	89.0	123	-	-
Mercury	14.9	15.1	102	108	-	-
Molybdenum	47.5	49.1	103	117	-	-
Nickel	295	252	85.3	149	-	-
Potassium	1800	1620	90.1	104	-	-
Selenium	93.6	75.1	80.3	122	-	-
Silver	80.6	65.7	81.5	117	-	-
Sodium	232	244	105	99	-	-
Strontium	133	94.9	71.4	76	-	-
Thallium	158	129	81.7	109	-	-
Tin	113	89.6	79.3	78	-	-
Titanium	145	126	87.1	70	-	-
Uranium	48.2	40.8	84.7	30	-	-
Vanadium	116	96.1	82.8	112	-	-
Zinc	184	156	84.7	153	-	-

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1. The **Certified Values** are the actual gravimetric/volumetric "made-to" concentrations confirmed by ERA analytical verification. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The **Uncertainty** represents an expanded uncertainty and approximates a 95% confidence interval. The uncertainty is based on the characterization, homogeneity and stability characteristics of the product, multiplied by a coverage factor (k=2). The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product. The formula used to calculate the expanded uncertainty is:
$U_{expanded} = k * SQRT((U_{char}^2) + (U_{homogen}^2) + (U_{LTS}^2) + (U_{STS}^2) + (U_{RSS}^2))$

Where:

Uexpanded = Expanded uncertainty.
k = Coverage factor.
Uchar = Combined standard uncertainty of the manufacturing and/or analytical verification assessment.
Uhomogen = Standard uncertainty of the homogeneity assessment.
ULTS = Standard uncertainty associated with long-term stability.
USTS = Standard uncertainty associated with short-term (transport) stability.
URSS = Standard uncertainty associated with repeated sampling of the product (where permitted by product use instructions).

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this certified reference material alongside USEPA and NELAC compliant PT study materials. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and therefore, the acceptance limits of this certified reference material and any PT study material may differ relative to their difference in concentrations.

5. The **PT Performance Data** include the mean value, percent recovery and number of data points reported by laboratories in our Proficiency Testing study compared to the Certified Values. In the event this lot was not used in a proficiency testing scheme, the data displayed was generated internally by ERA.

6. Where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. **Analytical Traceability Recovery (%)** = [(% recovery ERA certified reference material)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing this ERA certified reference material and/or it's associated stock solution(s) against the applicable NIST SRMs.

7. **Metrological Traceability.** This certified reference material is metrologically traceable to NIST mass reference materials through an unbroken chain of comparisons.

8. For additional information on this product such as intended use, storage information, instructions for use, minimum sample size, and safety information, please refer to the Product Use Instructions provided.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer

Brian Miller

Brian Miller

Senior Technical Manager

Craig Huff

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Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: AR-6020ICS-0A10

Lot Number: T2-MEB719898

Matrix: 1.4% (v/v) HNO3

Value / Analyte(s):

1 000 µg/mL ea:
Chloride,

200 µg/mL ea:
Carbon,

100 µg/mL ea:
Calcium, Aluminum,
Iron, Potassium,
Magnesium, Sodium,
Phosphorus, Sulfur,

2 µg/mL ea:
Titanium, Molybdenum

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	**100.0 ± 0.4 µg/mL**	**Calcium, Ca**	**100.0 ± 0.5 µg/mL**
Carbon, C	**200.1 ± 0.5 µg/mL**	**Chloride, Cl**	**1 000 ± 5 µg/mL**
Iron, Fe	**100.0 ± 0.5 µg/mL**	**Magnesium, Mg**	**100.0 ± 0.5 µg/mL**
Molybdenum, Mo	**2.001 ± 0.014 µg/mL**	**Phosphorus, P**	**100.0 ± 0.6 µg/mL**
Potassium, K	**100.0 ± 0.5 µg/mL**	**Sodium, Na**	**100.0 ± 0.5 µg/mL**
Sulfur, S	**100.0 ± 0.5 µg/mL**	**Titanium, Ti**	**2.001 ± 0.015 µg/mL**

Density: 1.009 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
C	Acidimetric	84L	84L
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cl	Acidimetric	84L	84L
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mo	ICP Assay	3134	130418
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
S	Acidimetric	84L	84L
S	ICP Assay	traceable to 3154	P2-S680745
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 07, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 07, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

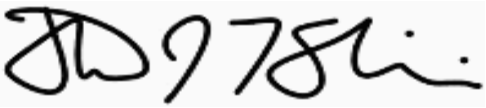
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Analytical Resources, LLC
Analytical Chemists and Consultants

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 7471B
Total Metals

SIB-SED-MG-AAM169-NW-06172

Laboratory:	Analytical Resources, LLC				
Client:	HydroGeoLogic, Inc.				
Project:	Portland Harbor Superfund Site 2021-2023				
Matrix:	Sediment	Laboratory ID:	23F0627-01 A	SDG:	23F0627
Sampled:	06/18/23 13:20	Prepared:	07/12/23 10:51	File ID:	SMM 07-14-23-062
% Solids:	78.54	Preparation:	SMM EPA 7471B	Analyzed:	07/14/23 15:58
Batch:	BLG0208	Sequence:	SLG0173	Initial/Final:	0.213 g Wet / 50 mL
Instrument:	HYDRA			Calibration:	GG00036

CAS NO.	Analyte	Concentration (mg/kg dry)	Dilution Factor	MDL	LOD	LOQ	Q
7439-97-6	Mercury	0.00684	1	0.00628	0.0149	0.0299	J

Analytical Resources, LLC
Analytical Chemists and Consultants

PREPARATION BATCH SUMMARY

EPA 7471B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Batch:	BLG0208 Batch Matrix: Solid	Preparation:	SMM EPA 7471B

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
SIB-SED-MG-AAM169-NW-06172	23F0627-01	SMM 07-14-23-062	07/12/23 10:51	FROZEN VOLUME USED
Blank	BLG0208-BLK1	SMM 07-14-23-012	07/12/23 10:51	
LCS	BLG0208-BS1	SMM 07-14-23-013	07/12/23 10:51	
Reference	BLG0208-SRM1	SMM 07-14-23-024	07/12/23 10:51	

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Mercury Digestion Log

Prep Code: SMM | Balance ID: BAL10 | Matrix: Solid
Analyst: AS | Block ID: 9 | Date: 7/13/23
Bath Temp: 99C | Start Time: 12:17 | End Time: 13:24

ARI Sample ID	Sample Bottle #	pH<2	Initial Weight (g) Volume (mL)	Final Volume (mL)	# $KMnO_4$ Aliquots	CLP	Comments
23F0303-01	A		0.202	50	1		
-02	↓		0.238				
-03	B		0.208				
-04	A		0.252				
-05			0.210				
-06			0.211				
-07			0.238				
-08			0.206				
-09			0.214				
-10			0.227				
-11			0.292				
-12	↓		0.295				
-13	B		0.220				
-14	A		0.246				
-15			0.201				
-16			0.214				
-17			0.208				
-18			0.254				
-19	↓		0.286				
23F0627-01	A		0.213				
BLG0208-BLK	—		—				
-BS	—		—				
-DUP	—		0.200				23F0303-01
-MS	—		0.204				
-MSD	—		0.201				

Chemical/Reagent ID:

HNO_3: L5605 | H_2SO_4: L423 | HCl: —
5% $K_2S_2O_8$: 66465 | 5% $KMnO_4$: L4187 | Digest Tube Lot: 2206050

5037F

Revision 008
11/8/22

Page one of two

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Mercury Digestion Log

Prep Code: —
Analyst: —
Bath Temp: —
Balance ID: —
Block ID: —
Start Time: —
Matrix: —
Date: —
End Time: —

ARI Sample ID	Sample Bottle #	pH<2	Initial Weight (g) Volume (mL)	Final Volume (mL)	# $KMnO_4$ Aliquots	CLP	Comments
SPM	—	—	0.204	50	1		

7/12/23 AS

Chemical/Reagent ID:

HNO_3: —
5% $K_2S_2O_8$: —
H_2SO_4: —
5% $KMnO_4$: —
HCl: —
Digest Tube Lot: —

5037F

Revision 008
11/8/22

Page two of two

Analytical Resources, LLC
Analytical Chemists and Consultants

Form I

METHOD BLANK DATA SHEET

EPA 7471B

Total Metals

Blank

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021
Batch: BLG0208
Laboratory ID: BLG0208-BLK1
Prepared: 07/12/23 10:51
Matrix: Solid
Preparation: SMM EPA 7471B
Analyzed: 07/14/23 12:45
Sequence: SLG0173
Calibration: GG00036
Instrument: HYDRA

CAS NO.	Analyte	Concentration (mg/kg wet)	Dilution Factor	MDL	LOD	LOQ	Q
7439-97-6	Mercury	ND	1	0.00525	0.0125	0.0250	U

Analytical Resources, LLC
Analytical Chemists and Consultants

LCS / LCS DUPLICATE RECOVERY

EPA 7471B

Total Metals

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Matrix:	Solid	Analyzed:	07/14/23 12:47
Batch:	BLG0208	Laboratory ID:	BLG0208-BS1
Preparation:	SMM EPA 7471B	Sequence Name:	LCS
Initial/Final:	0.2 g / 50 mL		

COMPOUND	SPIKE ADDED (mg/kg wet)	LCS CONCENTRATION (mg/kg wet)	Q	LCS % REC. #	QC LIMITS REC.
Mercury	0.500	0.473		94.6	80 - 120

* Indicates values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

STANDARD REFERENCE MATERIAL RECOVERY

EPA 7471B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Matrix: Solid
Laboratory ID: BLG0208-SRM1
Batch: BLG0208
Initial/Final: 0.204 g / 50 mL
Preparation: SMM EPA 7471B
Analyzed: 07/14/2023 14:24
Standard ID: L000950
Expires: 04/01/2026
Standard Lot#: D120-540
Description: Metals In Soil

ANALYTE	TRUE (mg/kg wet)	FOUND (mg/kg wet)	MDL	LOQ	Q	SRM % REC.	QC LIMITS REC.
Mercury	14.900	14.2	0.103	0.490	D	95.5	74.5 - 128.86

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL CALIBRATION DATA

EPA 7471B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Calibration:	GG00036	Instrument:	HYDRA
Calibration Date:	07/14/2023 16:57		

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF
Mercury	0	0	0.0001	6830000	0.0005	6474000	0.001	6438000	0.002	6462500	0.005	6164000

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL CALIBRATION DATA

EPA 7471B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Calibration:	GG00036	Instrument:	HYDRA
Calibration Date:	07/14/2023 16:57		

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Mercury	5394750	49.1	0.9996		0.99	

SMM 07-14-23

SLG0173

6600036

Method: ARI 5 ppb (NO 0.05) Operator: Admin Date of Analysis: 14 Jul 2023 12:06:58

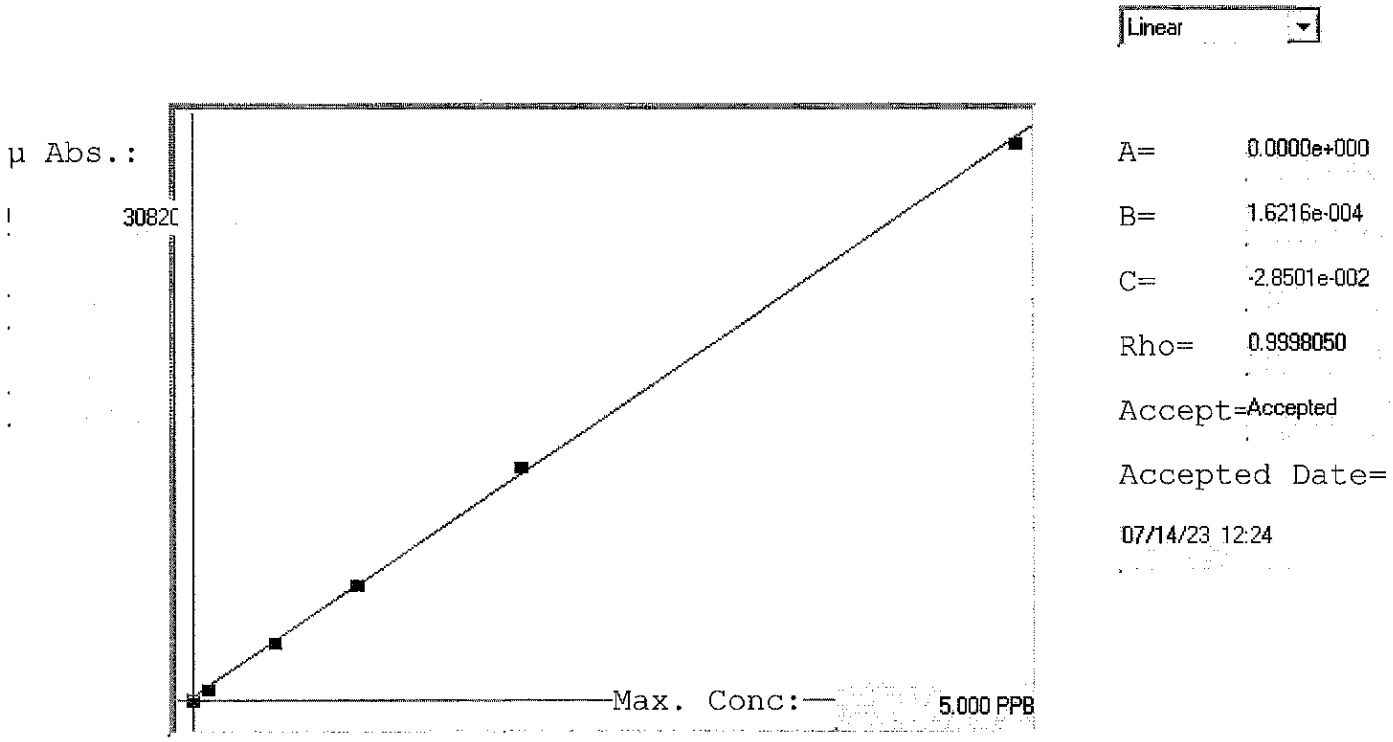
Sample ID	Mean	Units		Date	Method
SEQ-CAL1	-14	PPB		14 Jul 2023 12:07:12	ARI 5 ppb (NO 0.05)
SEQ-CAL2	683	PPB		14 Jul 2023 12:09:34	ARI 5 ppb (NO 0.05)
SEQ-CAL3	3237	PPB		14 Jul 2023 12:11:55	ARI 5 ppb (NO 0.05)
SEQ-CAL4	6438	PPB		14 Jul 2023 12:14:15	ARI 5 ppb (NO 0.05)
SEQ-CAL5	12925	PPB		14 Jul 2023 12:16:36	ARI 5 ppb (NO 0.05)
SEQ-CAL6	30820	PPB		14 Jul 2023 12:18:56	ARI 5 ppb (NO 0.05)
SEQ-ICV	98.7% 3.9461	PPB	✓	14 Jul 2023 12:33:35	ARI 5 ppb (NO 0.05)
SEQ-ICB	-0.0260	PPB	✓	14 Jul 2023 12:35:53	ARI 5 ppb (NO 0.05)
SEQ-CRL	81.1% 0.0811	PPB	✓	14 Jul 2023 12:38:15	ARI 5 ppb (NO 0.05)
SEQ-CCV	96.6% 3.8650	PPB	✓	14 Jul 2023 12:40:35	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0285	PPB	✓	14 Jul 2023 12:42:54	ARI 5 ppb (NO 0.05)
BLG0208-BLK1	-0.0237	PPB		14 Jul 2023 12:45:16	ARI 5 ppb (NO 0.05)
BLG0208-BS1	1.8917	PPB	✓	14 Jul 2023 12:47:35	ARI 5 ppb (NO 0.05)
BLG0228-BLK1	-0.0247	PPB		14 Jul 2023 12:49:54	ARI 5 ppb (NO 0.05)
BLG0228-BS1	1.9117	PPB	✓	14 Jul 2023 12:52:14	ARI 5 ppb (NO 0.05)
SEQ-CCV	97.8% 3.9118	PPB	✓	14 Jul 2023 12:54:33	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0284	PPB	✓	14 Jul 2023 12:56:51	ARI 5 ppb (NO 0.05)
SEQ-CCV	95.0% 3.7990	PPB	✓	14 Jul 2023 14:10:34	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0268	PPB	✓	14 Jul 2023 14:12:52	ARI 5 ppb (NO 0.05)
23F0303-01	0.7186	PPB		14 Jul 2023 14:15:13	ARI 5 ppb (NO 0.05)
BLG0208-DUP1	0.6832	PPB		14 Jul 2023 14:17:33	ARI 5 ppb (NO 0.05)
BLG0208-MS1	1.7770	PPB	✓	14 Jul 2023 14:19:52	ARI 5 ppb (NO 0.05)
BLG0208-MSD1	1.8551	PPB	✓	14 Jul 2023 14:22:11	ARI 5 ppb (NO 0.05)
BLG0208-SRM1	2.9027	PPB	✓	14 Jul 2023 14:24:30	ARI 5 ppb (NO 0.05)
23F0303-02	0.6703	PPB		14 Jul 2023 14:26:49	ARI 5 ppb (NO 0.05)
23F0303-03	0.3873	PPB		14 Jul 2023 14:29:09	ARI 5 ppb (NO 0.05)
~~23F0303-04~~	~~37.9488~~	~~PPB~~	Del	14 Jul 2023 14:31:29	ARI 5 ppb (NO 0.05)
~~23F0303-05~~	~~5.5740~~	~~PPB~~		14 Jul 2023 14:33:49	ARI 5 ppb (NO 0.05)
23F0303-06	0.5415	PPB		14 Jul 2023 14:36:12	ARI 5 ppb (NO 0.05)
SEQ-CCV	95.3% 3.8131	PPB		14 Jul 2023 14:38:33	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0257	PPB		14 Jul 2023 14:40:53	ARI 5 ppb (NO 0.05)
23F0303-07	0.0165	PPB		14 Jul 2023 14:43:13	ARI 5 ppb (NO 0.05)
23F0303-08	0.0438	PPB		14 Jul 2023 14:45:35	ARI 5 ppb (NO 0.05)
23F0303-09	1.1634	PPB		14 Jul 2023 14:47:56	ARI 5 ppb (NO 0.05)
23F0303-10	0.1713	PPB		14 Jul 2023 14:50:15	ARI 5 ppb (NO 0.05)
23F0303-11	0.2450	PPB		14 Jul 2023 14:52:35	ARI 5 ppb (NO 0.05)
23F0303-12	0.4465	PPB		14 Jul 2023 14:54:54	ARI 5 ppb (NO 0.05)
23F0303-13	0.3993	PPB		14 Jul 2023 14:57:13	ARI 5 ppb (NO 0.05)
23F0303-14	0.3595	PPB		14 Jul 2023 14:59:32	ARI 5 ppb (NO 0.05)
23F0303-15	0.0988	PPB		14 Jul 2023 15:01:51	ARI 5 ppb (NO 0.05)
23F0303-16	0.1392	PPB		14 Jul 2023 15:04:11	ARI 5 ppb (NO 0.05)
SEQ-CCV	94.7% 3.7889	PPB	✓	14 Jul 2023 15:06:30	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0246	PPB	✓	14 Jul 2023 15:08:49	ARI 5 ppb (NO 0.05)
23F0303-17	0.2372	PPB	Del	14 Jul 2023 15:11:10	ARI 5 ppb (NO 0.05)
23F0303-18	0.0842	PPB		14 Jul 2023 15:13:30	ARI 5 ppb (NO 0.05)
23F0303-19	0.2707	PPB		14 Jul 2023 15:15:50	ARI 5 ppb (NO 0.05)
23F0627-01	0.0239	PPB		14 Jul 2023 15:18:11	ARI 5 ppb (NO 0.05)
23F0303-04	3.5249	PPB		14 Jul 2023 15:20:33	ARI 5 ppb (NO 0.05)
23F0303-05	2.8893	PPB		14 Jul 2023 15:22:52	ARI 5 ppb (NO 0.05)
23F0589-01	0.4479	PPB		14 Jul 2023 15:25:12	ARI 5 ppb (NO 0.05)
BLG0228-DUP1	0.4527	PPB		14 Jul 2023 15:27:31	ARI 5 ppb (NO 0.05)
BLG0228-MS1	1.4922	PPB		14 Jul 2023 15:29:51	ARI 5 ppb (NO 0.05)
23F0589-02	0.1736	PPB		14 Jul 2023 15:32:11	ARI 5 ppb (NO 0.05)
SEQ-CCV	(L)49.5% 1.9817	PPB		14 Jul 2023 15:34:30	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0209	PPB		14 Jul 2023 15:36:49	ARI 5 ppb (NO 0.05)
23F0590-01	-0.0285	PPB		14 Jul 2023 15:39:10	ARI 5 ppb (NO 0.05)
SEQ-CCV	96.6% 3.8643	PPB	✓	14 Jul 2023 15:46:45	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0267	PPB	✓	14 Jul 2023 15:49:03	ARI 5 ppb (NO 0.05)
23F0303-17	0.2412	PPB		14 Jul 2023 15:51:24	ARI 5 ppb (NO 0.05)
23F0303-18	0.0866	PPB		14 Jul 2023 15:53:44	ARI 5 ppb (NO 0.05)
23F0303-19	0.2740	PPB		14 Jul 2023 15:56:05	ARI 5 ppb (NO 0.05)
23F0627-01	0.0229	PPB		14 Jul 2023 15:58:26	ARI 5 ppb (NO 0.05)
23F0303-04	4.2756	PPB	10X	14 Jul 2023 16:00:47	ARI 5 ppb (NO 0.05)
23F0303-05	2.7962	PPB	2X	14 Jul 2023 16:03:07	ARI 5 ppb (NO 0.05)
23F0589-01	0.4488	PPB		14 Jul 2023 16:05:27	ARI 5 ppb (NO 0.05)
BLG0228-DUP1	0.4556	PPB		14 Jul 2023 16:07:46	ARI 5 ppb (NO 0.05)
BLG0228-MS1	1.4989	PPB	✓	14 Jul 2023 16:10:06	ARI 5 ppb (NO 0.05)

SMM 07-14-23

Method: ARI 5 ppb (NO 0.05) Operator: Admin Date of Analysis: 14 Jul 2023 12:06:58

Sample ID	Mean	Units	Date	Method
23F0589-02	0.1750	PPB	14 Jul 2023 16:12:26	ARI 5 ppb (NO 0.05)
SEQ-CCV	96.4% 3.8562	PPB	14 Jul 2023 16:14:45	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0254	PPB	14 Jul 2023 16:17:04	ARI 5 ppb (NO 0.05)
23F0590-01	0.2995	PPB	14 Jul 2023 16:19:25	ARI 5 ppb (NO 0.05)
23G0052-01	0.8281	PPB	14 Jul 2023 16:21:44	ARI 5 ppb (NO 0.05)
23G0052-02	0.3097	PPB	14 Jul 2023 16:24:04	ARI 5 ppb (NO 0.05)
23G0052-03	0.2293	PPB	14 Jul 2023 16:26:24	ARI 5 ppb (NO 0.05)
23G0052-04	0.0375	PPB	14 Jul 2023 16:28:45	ARI 5 ppb (NO 0.05)
23G0052-05	0.0964	PPB	14 Jul 2023 16:31:06	ARI 5 ppb (NO 0.05)
23G0135-01	0.0973	PPB	14 Jul 2023 16:33:26	ARI 5 ppb (NO 0.05)
23G0135-02	0.0967	PPB	14 Jul 2023 16:35:46	ARI 5 ppb (NO 0.05)
23G0201-01	-0.0196	PPB	14 Jul 2023 16:38:05	ARI 5 ppb (NO 0.05)
SEQ-CCV	95.1% 3.8052	PPB	14 Jul 2023 16:40:26	ARI 5 ppb (NO 0.05)
SEQ-CCB	-0.0271	PPB	14 Jul 2023 16:42:44	ARI 5 ppb (NO 0.05)

ARI 5 ppb (NO 0.05)



Std ID	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
SEQ-CAL1 - Blank	0.000	-0.031	-0.031	-14	1.700	-12	-15	-16		
SEQ-CAL2 - 0.1 PPB	0.100	0.082	-0.018	683	0.4 %	680	683	687		
SEQ-CAL3 - 0.5 PPB	0.500	0.496	-0.004	3237	0.2 %	3226	3243	3243		
SEQ-CAL4 - 1.0 PPB	1.000	1.015	0.015	6437	1.3 %	6319	6513	6481		
SEQ-CAL5 - 2.0 PPB	2.000	2.067	0.067	12924	0.4 %	12869	12901	13004		
SEQ-CAL6 - 5.0 PPB	5.000	4.969	-0.031	30820	1.1 %	30360	31221	30880		

Mercury Analysis Log

Analyst: ML

Instrument: HYDRA

Date: 07/14/23

Page: 1 of 3

ARI Sample ID	Prep Code	Dilution	QC Data (ppb)	Comments
SEQ -CM1	SMM	1X		
-CM2				
-CM3				
-CM4				
-CM5				
-CM6				
-ICV			✓ 3.94	
-ICB			✓ -0.02	
-CRL			✓ 0.08	
-CCV				
-CCB				
BLG0208 -BLK1				
-BS1			✓ 1.891	94.5%R
BLG0228 -BLK1				
-BS1			✓ 1.911	95.5%R
SEQ -CCV				
-CCB				
-CCV				
-CCB				
23F0303 -01				
BLG0208 -DUP1				NO RPD
-MS1			✓ 1.777	105.8%R
-MSD1			✓ 1.855	113.6%R
-SRM1		20X	✓ 2.90	
23F0303 -02		1X		
-03				
-04				re-run at dil. Rel
-05				re-run at dil. ✓
-06				
SEQ -CCV				

Chemical/Reagent ID:

10% $SnCl_2$: L6923

14% $NH_2OH/NaCl$: L7085

Standard ID:

Standard: L7692, L7685-L7689

ICV/CCV: L7691

Mercury Analysis Log

Analyst: — Date: —

Instrument: — Page: 2 of 3

ARI Sample ID	Prep Code	Dilution	QC Data (ppb)	Comments
↓ -CCB			✓ -0.02	
23F0303 -07				
-08				
-09				
-10				
-11				
-12				
-13				
-14				
-15				
↓ -16				
SEQ -CCV			✓ 3.78	
↓ -CCB			✓ -0.024	
23F0303 -17				Bad CCV; Del
-18				
↓ -19		↓		
23F0627 -01				
23F0303 -04		10X		
↓ -05		2X		
23F0589 -01		1X		
BL60228 -DUP1				
↓ -MS1				
23F0589 -02				
SEQ -CCV			× 1.98	empty
↓ -CCB				
23F0590 -01				no read
SEQ -CCV			✓ 3.86	
↓ -CCB			✓ -0.02	
23F0303 -17				
-18				

Chemical/Reagent ID:
10% $SnCl_2$: — 14% $NH_2OH/NaCl$: —

Standard ID: —
Standard: _____ ICV/CCV: _____

Mercury Analysis Log

Analyst: — **Date:** —

Instrument: — **Page:** 3 of 3

ARI Sample ID	Prep Code	Dilution	QC Data (ppb)	Comments
↓ -19	↓	↓		
23F0627 -01		↓		
23F0303 -04		10X		
↓ -05		2X		
23F0589 -01		1X		
BLG0228 -DUP1				RPD=1.50
↓ -MS1			✓ 1.498	105%R
23F0589 -02				
SEQ -CCV			✓ 3.85	
↓ -CCB			✓ -0.02	
23F0590 -01				
23G0052 -01				
-02				
-03				
-04				
↓ -05				
23F0135 -01				
↓ -02				
23G0201 -01				
SEQ -CCV			✓ 3.80	
↓ -CCB	↓	↓	✓ -0.02	
	MI 07/14/23			

Chemical/Reagent ID:

10% $SnCl_2$: — **14% $NH_2OH/NaCl$:** —

Standard ID:

Standard: — **ICV/CCV:** —

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL AND CONTINUING CALIBRATION CHECK

EPA 7471B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: HYDRA
Calibration: GG00036
Control Limt: +/- 20.00%
Sequence: SLG0173

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SLG0173-ICV1	Mercury	0.0040000	0.00395	98.7	mg/L	EPA 7471B
SLG0173-CCV1	Mercury	0.0040000	0.00387	96.6	mg/L	EPA 7471B
SLG0173-CCV2	Mercury	0.0040000	0.00391	97.8	mg/L	EPA 7471B
SLG0173-CCV3	Mercury	0.0040000	0.00380	95.0	mg/L	EPA 7471B
SLG0173-CCV4	Mercury	0.0040000	0.00381	95.3	mg/L	EPA 7471B
SLG0173-CCV5	Mercury	0.0040000	0.00379	94.7	mg/L	EPA 7471B
SLG0173-CCV6	Mercury	0.0040000	0.00386	96.6	mg/L	EPA 7471B
SLG0173-CCV7	Mercury	0.0040000	0.00386	96.4	mg/L	EPA 7471B
SLG0173-CCV8	Mercury	0.0040000	0.00381	95.1	mg/L	EPA 7471B

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 7471B

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: HYDRA
Sequence: SLG0173

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00036
Date Analyzed: 07/14/23 12:35

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0173-ICB1	Mercury	-0.000026	0.000021	0.000100	mg/L	
SLG0173-CCB1	Mercury	-0.000029	0.000021	0.000100	mg/L	
SLG0173-CCB2	Mercury	-0.000028	0.000021	0.000100	mg/L	
SLG0173-CCB3	Mercury	-0.000027	0.000021	0.000100	mg/L	
SLG0173-CCB4	Mercury	-0.000026	0.000021	0.000100	mg/L	
SLG0173-CCB5	Mercury	-0.000025	0.000021	0.000100	mg/L	
SLG0173-CCB6	Mercury	-0.000027	0.000021	0.000100	mg/L	
SLG0173-CCB7	Mercury	-0.000025	0.000021	0.000100	mg/L	
SLG0173-CCB8	Mercury	-0.000027	0.000021	0.000100	mg/L	

Analytical Resources, LLC
Analytical Chemists and Consultants

ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 7471B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0173	Instrument:	HYDRA
		Calibration:	GG00036

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Cal Standard	SLG0173-CAL1	SMM 07-14-23-001	NA	07/14/23 12:07
Cal Standard	SLG0173-CAL2	SMM 07-14-23-002	NA	07/14/23 12:09
Cal Standard	SLG0173-CAL3	SMM 07-14-23-003	NA	07/14/23 12:11
Cal Standard	SLG0173-CAL4	SMM 07-14-23-004	NA	07/14/23 12:14
Cal Standard	SLG0173-CAL5	SMM 07-14-23-005	NA	07/14/23 12:16
Cal Standard	SLG0173-CAL6	SMM 07-14-23-006	NA	07/14/23 12:18
Initial Cal Check	SLG0173-ICV1	SMM 07-14-23-007	NA	07/14/23 12:33
Initial Cal Blank	SLG0173-ICB1	SMM 07-14-23-008	NA	07/14/23 12:35
Instrument RL Check	SLG0173-CRL1	SMM 07-14-23-009	NA	07/14/23 12:38
Calibration Check	SLG0173-CCV1	SMM 07-14-23-010	NA	07/14/23 12:40
Calibration Blank	SLG0173-CCB1	SMM 07-14-23-011	NA	07/14/23 12:42
Blank	BLG0208-BLK1	SMM 07-14-23-012	Solid	07/14/23 12:45
LCS	BLG0208-BS1	SMM 07-14-23-013	Solid	07/14/23 12:47
Calibration Check	SLG0173-CCV2	SMM 07-14-23-016	NA	07/14/23 12:54
Calibration Blank	SLG0173-CCB2	SMM 07-14-23-017	NA	07/14/23 12:56
Calibration Check	SLG0173-CCV3	SMM 07-14-23-018	NA	07/14/23 14:10
Calibration Blank	SLG0173-CCB3	SMM 07-14-23-019	NA	07/14/23 14:12
Reference	BLG0208-SRM1	SMM 07-14-23-024	Solid	07/14/23 14:24
Calibration Check	SLG0173-CCV4	SMM 07-14-23-030	NA	07/14/23 14:38
Calibration Blank	SLG0173-CCB4	SMM 07-14-23-031	NA	07/14/23 14:40
Calibration Check	SLG0173-CCV5	SMM 07-14-23-042	NA	07/14/23 15:06
Calibration Blank	SLG0173-CCB5	SMM 07-14-23-043	NA	07/14/23 15:08
Calibration Check	SLG0173-CCV6	SMM 07-14-23-057	NA	07/14/23 15:46
Calibration Blank	SLG0173-CCB6	SMM 07-14-23-058	NA	07/14/23 15:49
SIB-SED-MG-AAM169-NW-06172	23F0627-01	SMM 07-14-23-062	Solid	07/14/23 15:58
Calibration Check	SLG0173-CCV7	SMM 07-14-23-069	NA	07/14/23 16:14
Calibration Blank	SLG0173-CCB7	SMM 07-14-23-070	NA	07/14/23 16:17
Calibration Check	SLG0173-CCV8	SMM 07-14-23-080	NA	07/14/23 16:40
Calibration Blank	SLG0173-CCB8	SMM 07-14-23-081	NA	07/14/23 16:42

Analytical Resources, LLC
Analytical Chemists and Consultants

DETECTION LEVEL STANDARD
EPA 7471B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: HYDRA
Calibration: GG00036
Sequence: SLG0173
Lab Sample ID: SLG0173-CRL1

Analyte	True	Found	%R	Units	QC Limts
Mercury	0.000100	0.000081	81.1	mg/L	70 - 130

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HOLDING TIME SUMMARY

Analysis: EPA 7471B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
SIB-SED-MG-AAM169-NW-06172 23F0627-01	06/18/23 13:20	06/27/23 09:37	07/12/23 10:51	23	180	07/14/23 15:58	26	180	

* Indicates hold time exceedance.

Analytical Resources, LLC
Analytical Chemists and Consultants

METHOD DETECTION AND REPORTING LIMITS

EPA 7471B

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-202
Matrix: Solid
Instrument: HYDRA

Analyte	MDL	LOD	Units
Mercury	0.00525	0.0125	mg/kg

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGHG1
Lot Number:	S2-HG711246
Matrix:	5% (v/v) HNO3
Value / Analyte(s):	1 000 µg/mL ea: Mercury
Starting Material:	Hg Metal
Starting Material Lot#:	1959
Starting Material Purity:	99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 1000 ± 3 µg/mL

Density: 1.026 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1	**1004 ± 6 µg/mL** ICP Assay NIST SRM 3133 Lot Number: 160921
Assay Method #2	**998 ± 3 µg/mL** EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	**1001 ± 3 µg/mL** Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000210	M	Eu	<	0.000210	O	Na		0.000626	M	Se	<	0.008100	M	Zn	<	0.000810
M	Al		0.000161	O	Fe	<	0.001600	M	Nb	<	0.000410	O	Si		0.000626	M	Zr	<	0.000410
M	As	<	0.002500	M	Ga	<	0.000210	M	Nd	<	0.000210	M	Sm	<	0.000210				
O	Au	<	0.001700	M	Gd	<	0.000210	O	Ni	<	0.001400	M	Sn	<	0.000410				
M	B	<	0.008500	M	Ge	<	0.000410	M	Os	<	0.003900	O	Sr	<	0.000110				
M	Ba	<	0.000210	M	Hf	<	0.000210	O	P	<	0.029000	M	Ta	<	0.000210				
O	Be	<	0.000110	s	Hg	<		M	Pb	<	0.000210	M	Tb	<	0.000210				
M	Bi	<	0.001100	M	Ho	<	0.000210	M	Pd	<	0.003500	M	Te	<	0.005700				
O	Ca		0.004754	M	In	<	0.000210	M	Pr	<	0.000210	M	Th	<	0.000210				
M	Cd	<	0.000210	M	Ir	<	0.000210	M	Pt	<	0.000210	O	Ti	<	0.000430				
M	Ce	<	0.000210	O	K		0.000731	M	Rb	<	0.000210	O	Tl	<	0.005400				
M	Co	<	0.000210	M	La	<	0.000210	M	Re	<	0.000210	M	Tm	<	0.000210				
O	Cr	<	0.003300	O	Li	<	0.000110	M	Rh	<	0.001100	M	U	<	0.000410				
M	Cs	<	0.000410	M	Lu	<	0.000210	M	Ru	<	0.000810	M	V	<	0.000210				
M	Cu	<	0.000810	O	Mg		0.000104	O	S	<	0.022000	M	W	<	0.001100				
M	Dy	<	0.000210	O	Mn	<	0.000430	M	Sb	<	0.000210	M	Y	<	0.000210				
M	Er	<	0.000210	M	Mo	<	0.000210	M	Sc	<	0.000210	M	Yb	<	0.000210				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 200.59 +2 4 Hg(OH)(aq) 1+
Chemical Compatibility - Stable in HNO3. Avoid basic media forming insoluble carbonate. The sulfide, basic carbonate, oxalate, phosphate, arsenite, arsenate and iodide are insoluble in water.
Stability - 2-100 ppb levels not stable in 1% HNO3 / LDPE container, stable in 10% HNO3 packaged in borosilicate glass. 1-100 ppm levels stable in 7% HNO3 packaged in borosilicate glass. 1000-10,000 ppm solutions are chemically stable for years in 5-10% HNO3 / LDPE container.
Hg Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxide (Soluble in HNO3); Ores and Organic based (The literature has more references to the preparation of Hg containing samples than any other element. Please consult the literature for your specific sample type, since such preparations are prone to error. Or e-mail our technical staff and we will contact you to discuss your particular sample preparation questions in further detail.).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	**Interferences** (underlined indicates severe)
ICP-MS 202 amu	9 ppt	n/a	186W16O
ICP-OES 184.950 nm	0.03 / 0.005 µg/mL	1	
ICP-OES 194.227 nm	0.03 / 0.005 µg/mL	1	V
ICP-OES 253.652 nm	0.1 / 0.03 µg/mL	1	Ta, Co, Th ,Rh , Fe, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 18, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 18, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	QCP-QCS-4
Lot Number:	R2-MEB695951
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	5 µg/mL ea: Mercury

Second Source: Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Mercury, Hg	5.011 ± 0.023 µg/mL		

Density: 1.035 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Hg	ICP Assay	3133	061204
Hg	EDTA	928	928
Hg	Calculated		See Sec. 4.2

The follow ing equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 20, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 20, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

ERA
A Waters Company

Certified Reference Material

▪ Certificate of Analysis ▪

Product: Metals in Soil
Catalog Number: 540
Lot No. D120-540
Certificate Issue Date: December 16, 2022
Expiration Date: April 01, 2026
Revision Number: Original

L 000950

Product use instructions are included as part of the certification packet and are paginated separately from this Certificate of Analysis. Please reference the product use instructions for catalog #540 revision 111122.

CERTIFICATION

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Aluminum	9420	5640	2.77	1720 - 9560	2550 - 10400
Antimony	225	97.9	31.4	D.L. - 211	22.5 - 251
Arsenic	66.6	73.9	3.11	63.4 - 84.5	51.8 - 96.1
Barium	354	311	3.79	253 - 370	234 - 389
Beryllium	108	92.9	3.20	75.8 - 110	69.7 - 119
Boron	102	56.1	6.31	33.7 - 78.4	33.6 - 112
Cadmium	91.8	75.4	17.5	61.0 - 89.8	56.6 - 101
Calcium	2640	2580	2.84	2140 - 3030	1760 - 3410
Chromium	137	116	4.95	93.1 - 139	81.3 - 151
Cobalt	137	118	7.94	96.3 - 139	88.2 - 151
Copper	139	114	12.1	92.9 - 136	85.8 - 153
Iron	7100	6160	2.51	3500 - 8810	710 - 12700
Lead	247	212	4.43	170 - 253	156 - 272
Lithium	8.14	5.11	5.23	2.35 - 7.87	0.814 - 10.8
Magnesium	1560	1350	3.92	1010 - 1690	668 - 2030
Manganese	286	255	3.26	205 - 304	187 - 322
Mercury	14.9	15.1	7.72	11.1 - 19.1	9.09 - 21.2
Molybdenum	47.5	49.1	36.3	40.7 - 57.5	33.3 - 64.9
Nickel	295	252	69.7	204 - 299	176 - 327
Potassium	1800	1620	3.33	1170 - 2080	898 - 2340
Selenium	93.6	75.1	24.9	57.3 - 93.0	47.2 - 103
Silver	80.6	65.7	38.8	50.4 - 81.0	46.4 - 88.7
Sodium	232	244	3.54	189 - 299	122 - 365
Strontium	133	94.9	3.96	70.8 - 119	68.1 - 146

16341 Table Mountain Pkwy ▪ Golden, CO 80403 ▪ T: 800.372.0122 ▪ 303.431.8454 ▪ www.eraqc.com

▪ Certificate of Analysis ▪

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Thallium	158	129	21.1	101 - 157	89.5 - 174
Tin	113	89.6	23.1	67.4 - 112	49.9 - 129
Titanium	145	126	8.56	39.3 - 213	0.00 - 268
Uranium	48.2	40.8	3.84	29.4 - 52.3	28.4 - 53.2
Vanadium	116	96.1	6.62	73.6 - 119	64.2 - 128
Zinc	184	156	3.83	123 - 189	109 - 203

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ERA
A Waters Company

Certified Reference Material

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ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number[6]	Recovery
	mg/kg	mg/kg	%			%
Aluminum	9420	5640	59.9	101	-	-
Antimony	225	97.9	43.5	106	-	-
Arsenic	66.6	73.9	111	141	-	-
Barium	354	311	88.0	127	-	-
Beryllium	108	92.9	86.0	119	-	-
Boron	102	56.1	55.0	80	-	-
Cadmium	91.8	75.4	82.1	160	-	-
Calcium	2640	2580	97.9	102	-	-
Chromium	137	116	84.8	141	-	-
Cobalt	137	118	85.8	112	-	-
Copper	139	114	82.3	151	-	-
Iron	7100	6160	86.7	105	-	-
Lead	247	212	85.7	170	-	-
Lithium	8.14	5.11	62.8	14	-	-
Magnesium	1560	1350	86.4	102	-	-
Manganese	286	255	89.0	123	-	-
Mercury	14.9	15.1	102	108	-	-
Molybdenum	47.5	49.1	103	117	-	-
Nickel	295	252	85.3	149	-	-
Potassium	1800	1620	90.1	104	-	-
Selenium	93.6	75.1	80.3	122	-	-
Silver	80.6	65.7	81.5	117	-	-
Sodium	232	244	105	99	-	-
Strontium	133	94.9	71.4	76	-	-
Thallium	158	129	81.7	109	-	-
Tin	113	89.6	79.3	78	-	-
Titanium	145	126	87.1	70	-	-
Uranium	48.2	40.8	84.7	30	-	-
Vanadium	116	96.1	82.8	112	-	-
Zinc	184	156	84.7	153	-	-

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▪ Certificate of Analysis ▪

1. The **Certified Values** are the actual gravimetric/volumetric "made-to" concentrations confirmed by ERA analytical verification. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The **Uncertainty** represents an expanded uncertainty and approximates a 95% confidence interval. The uncertainty is based on the characterization, homogeneity and stability characteristics of the product, multiplied by a coverage factor (k=2). The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product. The formula used to calculate the expanded uncertainty is:
$U_{expanded} = k * SQRT((U_{char}^2) + (U_{homogen}^2) + (U_{LTS}^2) + (U_{STS}^2) + (U_{RSS}^2))$

Where:

Uexpanded = Expanded uncertainty.
k = Coverage factor.
Uchar = Combined standard uncertainty of the manufacturing and/or analytical verification assessment.
Uhomogen = Standard uncertainty of the homogeneity assessment.
ULTS = Standard uncertainty associated with long-term stability.
USTS = Standard uncertainty associated with short-term (transport) stability.
URSS = Standard uncertainty associated with repeated sampling of the product (where permitted by product use instructions).

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this certified reference material alongside USEPA and NELAC compliant PT study materials. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and therefore, the acceptance limits of this certified reference material and any PT study material may differ relative to their difference in concentrations.

5. The **PT Performance Data** include the mean value, percent recovery and number of data points reported by laboratories in our Proficiency Testing study compared to the Certified Values. In the event this lot was not used in a proficiency testing scheme, the data displayed was generated internally by ERA.

6. Where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. **Analytical Traceability Recovery (%)** = [(% recovery ERA certified reference material)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing this ERA certified reference material and/or it's associated stock solution(s) against the applicable NIST SRMs.

7. **Metrological Traceability.** This certified reference material is metrologically traceable to NIST mass reference materials through an unbroken chain of comparisons.

8. For additional information on this product such as intended use, storage information, instructions for use, minimum sample size, and safety information, please refer to the Product Use Instructions provided.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer

Brian Miller

Brian Miller

Senior Technical Manager

Craig Huff

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NOTE: Do not enter data in blue shaded cells as they are calculated fields. Green shaded cells MAY be altered if a rewigh is called for.

TOTAL SOLIDS (TS) BENCHSHEET for Solid samples

Method: Total Solids, Metals Correction

dry at 104°C (12-24 hr)

Batch:	BLG0227
Date:	7/12/2023 19:06
Analyst:	AR

Instrumentation

Drying Oven:	OVEN07	**Analytical Balance:**	BAL10

Batch drying time

record times as mm/dd/yy hh:mm

date/time in oven:	7/12/2023 19:42	Temp in:	106 °C
date/time out:	7/13/2023 15:40	Temp out:	105 °C
elapsed hrs =	20.0 OK		

TS (%) calculated as:
Final dry wt (g) = (Dry Wt - Tare Wt)
TS = (Final Dry Wt)/ (grams Sample-Tare)

Sample ID	Tare Weight (g)	Tare + Sample Weight (g)	Tare + Sample Dry Weight @ 104°C (g) 1	2	3	dry Wt (g)	TS (%)	Notes
23F0303-01	0.9870	10.0610	5.7670			4.7800	52.68%	
23F0303-02	0.9990	10.0520	6.5760			5.5770	61.60%	
23F0303-03	0.9970	10.0940	5.4270			4.4300	48.70%	
23F0303-04	0.9970	10.0660	6.3880			5.3910	59.44%	
23F0303-05	0.9990	10.0580	7.1640			6.1650	68.05%	
23F0303-06	0.9980	10.0610	7.7850			6.7870	74.89%	
23F0303-07	1.0030	10.0500	8.2670			7.2640	80.29%	
23F0303-08	0.9880	10.0410	7.1990			6.2110	68.61%	
23F0303-09	0.9890	10.0380	7.2020			6.2130	68.66%	
23F0303-10	0.9820	10.0850	7.7780			6.7960	74.66%	
23F0303-11	0.9720	10.0540	4.8990			3.9270	43.24%	
23F0303-12	0.9880	10.0450	6.3480			5.3600	59.18%	
23F0303-13	0.9980	10.0310	6.1710			5.1730	57.27%	
23F0303-14	0.9850	10.0790	5.1060			4.1210	45.32%	
23F0303-15	0.9950	10.0260	7.5530			6.5580	72.62%	
23F0303-16	0.9960	10.0400	5.1230			4.1270	45.63%	
23F0303-17	0.9920	10.0240	4.9750			3.9830	44.10%	
23F0303-18	1.0140	10.0230	6.6150			5.6010	62.17%	
23F0303-19	1.0140	10.0110	5.0330			4.0190	44.67%	
23F0627-01	1.0130	10.0010	8.0720			7.0590	78.54%	

Analytical Resources, LLC
Analytical Chemists and Consultants

Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

Total Metals

SIB-SED-MG-AAM169-NW-06172

Laboratory:	Analytical Resources, LLC				
Client:	HydroGeoLogic, Inc.				
Project:	Portland Harbor Superfund Site 2021-2023				
Matrix:	Sediment	Laboratory ID:	23F0627-01 A	SDG:	23F0627
Sampled:	06/18/23 13:20	Prepared:	07/12/23 10:49	File ID:	XDT_m1230714-107
% Solids:	78.54	Preparation:	SWN EPA 3050B	Analyzed:	07/14/23 22:56
Batch:	BLG0203	Sequence:	SLG0175	Initial/Final:	1.01 g Wet / 50 mL
Instrument:	ICPMS1			Calibration:	GG00039

CAS NO.	Analyte	Concentration (mg/kg dry)	Dilution Factor	MDL	LOD	LOQ	Q
7440-38-2	Arsenic	2.89	20	0.05	0.13	0.25	
7440-43-9	Cadmium	0.31	20	0.04	0.06	0.13	
7440-50-8	Copper	31.1	20	0.22	0.43	0.63	
7440-66-6	Zinc	161	20	1.2	2.5	7.6	

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PREPARATION BATCH SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC			SDG:	23F0627
Client:	HydroGeoLogic, Inc.			Project:	Portland Harbor Superfund Site 2021-2023
Batch:	BLG0203	Batch Matrix:	Solid	Preparation:	SWN EPA 3050B

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	07/12/23 10:49	Solids, use this one
Blank	BLG0203-BLK1	XDT_m1230714-063	07/12/23 10:49	
LCS	BLG0203-BS1	XDT_m1230714-064	07/12/23 10:49	
Reference	BLG0203-SRM1	XDT_m1230714-071	07/12/23 10:49	

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Digestion Log

Analyst: AS Date: 7/12/23 - 7/13/23 Time: 17:40 - 14:15 Balance ID: BAL10

Matrix: Solid Block ID: ~~BA~~ 3 Block Temp: 94C Thermometer: 20-4

ARI Sample ID	Btl #	pH<2	Prep Code: SWN Initial Wt (g) Vol (mL)	Prep Code: SWN Final Vol (mL)	Prep Code: Initial Wt (g) Vol (mL)	Prep Code: Final Vol (mL)	Comments
23F0303-01	A		1.064	50			
-02			1.086				
-03	B		1.029				
-04	A		1.013				
-05			1.002				
-06			1.009				
-07			1.073				
-08			1.009				
-09			1.039				
-10			1.027				
-11			1.053				
-12			1.018				
-13	B		1.041				
-14	A		1.042				
-15			1.020				
-16			1.071				
-17			1.038				
-18			1.069				
-19			1.008				
23F0627-01			1.010				
BLG0223-BLK	—		—				
-BS	—		—				
-DUP	—		1.064				23F0303-01
-MS	—		1.060				
-MSD	—		1.060				
-SRM	—		1.002				

Chemical/Reagent ID:

HNO_3: L560S 1:1 HNO_3: L6981 HCl: — H_2O_2: K11056

Tube Lot#: 2206050 Boiling Chip Lot#: — (DoD Only)

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Form I

METHOD BLANK DATA SHEET

EPA 6020B UCT-KED

Total Metals

Blank

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021
Batch: BLG0203
Laboratory ID: BLG0203-BLK1
Prepared: 07/12/23 10:49
Matrix: Solid
Preparation: SWN EPA 3050B
Analyzed: 07/14/23 19:38
Sequence: SLG0175
Calibration: GG00039
Instrument: ICPMS1

CAS NO.	Analyte	Concentration (mg/kg wet)	Dilution Factor	MDL	LOD	LOQ	Q
7440-38-2	Arsenic-75a	ND	20	0.04	0.10	0.20	U
7440-43-9	Cadmium-111	ND	20	0.03	0.05	0.10	U
7440-50-8	Copper-63	ND	20	0.17	0.34	0.50	U
7440-66-6	Zinc-67	ND	20	0.9	2.0	6.0	U

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LCS / LCS DUPLICATE RECOVERY

EPA 6020B UCT-KED

Total Metals

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Matrix:	Solid	Analyzed:	07/14/23 19:42
Batch:	BLG0203	Laboratory ID:	BLG0203-BS1
Preparation:	SWN EPA 3050B	Sequence Name:	LCS
Initial/Final:	1 g / 50 mL		

COMPOUND	SPIKE ADDED (mg/kg wet)	LCS CONCENTRATION (mg/kg wet)	Q	LCS % REC. #	QC LIMITS REC.
Arsenic-75a	25.0	24.8		99.1	80 - 120
Cadmium-111	25.0	25.4		102	80 - 120
Copper-63	25.0	26.1		104	80 - 120
Zinc-67	80.0	72.5		90.6	80 - 120

* Indicates values outside of QC limits

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STANDARD REFERENCE MATERIAL RECOVERY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Matrix: Solid
Laboratory ID: BLG0203-SRM1
Batch: BLG0203
Initial/Final: 1.002 g / 50 mL
Preparation: SWN EPA 3050B
Analyzed: 07/14/2023 20:12
Standard ID: L000950
Expires: 04/01/2026
Standard Lot#: D120-540
Description: Metals In Soil

ANALYTE	TRUE (mg/kg wet)	FOUND (mg/kg wet)	MDL	LOQ	Q	SRM % REC.	QC LIMITS REC.
Arsenic-75a	66.600	71.6	0.09	0.50	D	108	95.2 - 126.9
Cadmium-111	91.800	79.7	0.07	0.25	D	86.8	66.4 - 97.8
Copper-63	139.00	114	0.43	1.25	D	82.4	66.8 - 97.8
Zinc-66	184.00	155	7.3	15.0	D	84.2	66.8 - 102.7

* Values outside of QC limits

Analytical Resources, LLC
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INITIAL CALIBRATION DATA

EPA 6020B

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Calibration:	GG00039	Instrument:	ICPMS1
Calibration Date:	07/14/2023 15:09		

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF
Lead-208	0	0	0.1	45810	10	44279.9	20	43732.7	50	42807.64	100	40311.13

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INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC
Instrument: ICPMS1
Calibration: GG00039
Calibration Date: 7/14/2023

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Lead-208	36156.9	49.2	0.9990		0.998	

Analytical Resources, LLC
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INITIAL CALIBRATION DATA

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Calibration:	GG00039	Instrument:	ICPMS1
Calibration Date:	07/14/2023 15:09		

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF	Conc	RF
Arsenic-75a	0	0	0.2	325	10	301.6	20	301.45	50	291.76	100	297.43
Cadmium-111	0	0	0.1	250	10	265.6	20	256.35	50	251.6	100	254.91
Cadmium-114	0	0	0.1	670	10	672.1	20	667.15	50	656.26	100	666.9
Copper-63	0	0	0.5	4620	10	4560.2	20	4433.2	50	4276.8	100	4235.71
Copper-65	0	0	0.5	2408	10	2307.2	20	2300.1	50	2185.98	100	2159.05
Zinc-66	0	0	6	576.5	10	585.8	20	572.35	50	543.16	100	540.9
Zinc-67	0	0	6	96.33334	10	100.8	20	98.95	50	90.98	100	94.54

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INITIAL CALIBRATION DATA

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Instrument: ICPMS1
Calibration: GG00039
Calibration Date: 7/14/2023

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Arsenic-75a	252.8733	49.2	0.9999		0.998	
Cadmium-111	213.0767	49.1	0.9999		0.998	
Cadmium-114	555.4017	49.0	0.9999		0.998	
Copper-63	3687.652	49.2	0.9999		0.998	
Copper-65	1893.388	49.2	0.9998		0.998	
Zinc-66	469.785	49.1	0.9999		0.998	
Zinc-67	80.26722	49.2	0.9994		0.998	

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ICP/MS - 01 SAMPLE RUN LOG

PE Nexlon ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** MB **Sequence:** SLGØ175 **Cal:** GGØØØ39

All corrections made by analyst unless otherwise noted. MB 7/14/23

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		SEQ-CAL1	L7655		
		-CAL2	L76Ø1		
		-CAL3	L76Ø2		Gesl. noisy - int, R-Values + QC OK
		-CAL4	L76Ø3		
		-CAL5	L7656		
		-CAL6	L76Ø4		
		-IBL1	—		
		-ICV1	L6624		
	✓	-ICB1	—		Ca III ↑/Ca noisy
		~~-CC~~ ICB1	L7655		
		-CCV1	L7656		
	✓	-CCB1	—		Int. std line disconnected
		-CCB1	L7655		
		-CRL1	L76Ø1		
	✓	-IFA1	—		Cr^{53} ↑/Ge noisy
		-IFB1	L7657		
		-HCV1	L7534		
		-HCV2	L73Ø6		Cr^{52} ↓ - Cr<200
		-IBL2	—		
		-IFA1	L7219		Cr^{53} ↑
		-IBL3	—		
		-CCV2			
		-CCB2			
		BLGØ245-BLK2	REN		Ni only

Analytical Resources, Incorporated
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ICP/MS - 01 SAMPLE RUN LOG

PE Nexion ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** MS **Sequence:** — **Cal:** —

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		BLGØ245-BS2	REN		Ni only
		BLGØ268-BLK1	↓		
		↓ -BS1	↓		
	✓	23GØ246-Ø1	↓	2	Int. STD line disconnected
		↓ -Ø1	↓	↓	
		SEQ-IBL4			
		↓ -CCV3			
		↓ -CCB3			
		BLGØ243-BLK1	RHN		Cd only
		↓ -BS1	↓		↓
		↓ -BSD1	↓		↓
		23FØ286-Ø5RE1	↓		↓
		↓ -11RE1	↓		↓
		23FØ365-Ø6RE1	↓		↓
		↓ -Ø8RE1	↓		↓
		↓ -Ø9RE1	↓		↓
		↓ -11RE1	↓		↓
		SEQ-IBL5			
		↓ -CCV4			
	✓	↓ -CCB4			Cd st. no. 3y
		↓ -CCB4			
		23FØ286-Ø2RE1	RHN		Cd only
		BLGØ243-DUP1	↓		↓
		↓ -MS1	↓		↓

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ICP/MS - 01 SAMPLE RUN LOG

PE Nexion ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** MB **Sequence:** — **Cal:** —

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		SEQ-IBL6			
		23FØ364-59	REN		Cd only
		SEQ-IBL7			
		-CCV5			
		-CCB5			
	✓	-CAL1			
		-CCV6			
		-CCB6			
		BLGØ2Ø3-BLK1	SWN	20	
		-BS1			Tbsl. noisy - %Rec Analytes OK
	✓	-SRL1		100	
	✓	23FØ3Ø3-Ø1		20	Sc↑ - Not Needed
	✓	BLGØ2Ø3-DUP1			
	✓	-MS1			No Sample
	✓	-MSD1			Tb↑
	✓	-PS1			
		-SRM1			
		SEQ-IBL8			
		-CCV7			
		-CCB7			
		23FØ3Ø3-Ø2	SWN	20	Sc↑ - Not Needed
		-Ø3			
		-Ø4			Co, Zn, Pb↑ As, Cd only
		-Ø5			

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ICP/MS - 01 SAMPLE RUN LOG

PE Nexion ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** NB **Sequence:** — **Cal:** —

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		23F0303-06	SWN	20	
		-07			Sc↑ - Not Needed
		-08			
		-09			
		-10			
		SEQ-IBL9			
		-CCV8			
		-CCB8			
		23F0303-11	SWN	20	Sc↑ - Not Needed
		-12			
		-13			
		-14			
		-15			
		-16			Sc↑ - Not Needed
		-17			
		-18			
		-19			/ Ge rt no 3y — Cd, Pb only
		SEQ-IBL4			
		-CCV9			
		-CCB9			
		BLG0135-BLK3	REN		As only
		-BS3			
		23F0365-10			
		BLG0135-DUP5			

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ICP/MS - 01 SAMPLE RUN LOG

PE Nexion ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** MB **Sequence:** — **Cal:** —

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		BLGØ135-MS5	REN		As only
		↓ -MSD5	↓		↓
		23FØ365-21	↓		Co, Zn only
		↓ -39	↓		↓
		23FØ627-Ø1	SWN	20	
		SEQ-IBLB			
		-CCVA			
		-CCBA			
	✓	-CAL1			
		-CCVB			
		↓ -CCBB			
		23FØ365-14	REN	50	Co, Zn only
		-16	↓	↓	↓
		-36	↓	↓	↓
		-37	↓	↓	↓
		-38	↓	↓	↓
		-4Ø	↓	↓	↓
		-Ø4	↓	10	+Cd
		-24	↓	↓	↓
		↓ -31	↓	↓	Zn only
		SEQ-IBLC			
		-CCVC			
		↓ -CCBC			
		23FØ365-18	REN	20	Co, Zn only

Analytical Resources, Incorporated
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ICP/MS - 01 SAMPLE RUN LOG

PE Nexion ICP-MS Serial No. 85DN5032601

Analysis Date: 7/14/23 **Analyst:** MB **Sequence:** — **Cal:** —

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep Code	Dilution	Comments
		23FΦ365-23	REN	2	Cr, Zn only
		SEQ-IBLD			
		23FΦ65Φ-Φ1	REN	20	Ni, Zn only
		23FΦ652-Φ1	↓	2	Ni only
		23GΦΦ43-Φ1	↓	↓	Cu53 sl. noisy - isotopes agree
		23FΦ673-Φ1	↓	↓	Cr only
		BLGΦ246-DUP2	↓	↓	↓
		↓ -MS2	↓	↓	↓
		SEQ-IBLE			
		↓ -CCVD			
		↓ -CCBD			
		BLGΦ268-DUP1	REN	2	
		↓ -MS1	↓	↓	
		SEQ-IBLF			
		23FΦ496-Φ2	REN		As only
		BLGΦ135-DUP6	↓		↓
		↓ -MS6	↓		↓
		SEQ-IBLG			
		23GΦΦ21-Φ1	REN	10	No Mn
		23GΦΦΦ1-Φ2	↓	5	
		SEQ-IBLH			
		↓ -CCVE			
		↓ -CCBE			
		Rinse/DI			

Performance Check Report

Sample ID: STD Performance Check
Sample Date/Time: Friday, July 14, 2023 14:24:36
Sample Description:
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\STD Performance Check.mth
Dataset File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\Default\STD Performance Check.486
MassCal File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Conditions File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Dual Detector Mode: Pulse
Acq. Dead Time (ns): 35
Current Dead Time (ns): 35
Torch Z position (mm): 0.00

Summary

	Analyte	Mass	Meas. Intens. Mean	Net Intens. Mean	Net Intens. SD	Net Intens. RSD	Mode
	Be	9.0	6899.0	6898.999	103.334	1.5	Standard
	In	114.9	66476.5	-423991.672	1713.189	0.4	Standard
	U	238.1	81652.5	81652.477	2125.169	2.6	Standard
⌈	CeO	155.9	2013.9	0.023	0.001	4.2	Standard
| >	Ce	139.9	86414.3	86414.282	2961.609	3.4	Standard
⌊	Ce++	70.0	1135.5	0.013	0.001	6.0	Standard
	Bkgd	220.0	0.6	0.633	0.217	34.3	Standard

Current Conditions File Data

Current Value	Description
0.97	Nebulizer Gas Flow STD/KED [NEB]
1.20	Auxiliary Gas Flow
17.50	Plasma Gas Flow
-10.75	Deflector Voltage
1600.00	ICP RF Power
-1600.00	Analog Stage Voltage
1050.00	Pulse Stage Voltage
0.00	Quadrupole Rod Offset STD [QRO]
-10.00	Cell Rod Offset STD [CRO]
14.00	Discriminator Threshold
-5.00	Cell Entrance/Exit Voltage STD
0.00	RPa
0.45	RPq
0.97	DRC Mode NEB
-7.50	DRC Mode QRO
-2.00	DRC Mode CRO
-5.00	DRC Mode Cell Entrance/Exit Voltage
0.60	Cell Gas A
0.00	Cell Gas B
200.00	Axial Field Voltage
-11.00	KED Mode CRO
-12.00	KED Mode QRO
-11.00	KED Mode Cell Entrance Voltage
-33.00	KED Mode Cell Exit Voltage
0.00	KED Cell Gas A
3.00	KED Cell Gas B
0.00	KED RPa
0.25	KED RPq
125.00	KED Mode Axial Field Voltage

Performance Check Report

Sample ID: STD Performance Check
Sample Date/Time: Friday, July 14, 2023 14:33:21
Sample Description:
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\STD Performance Check.mth
Dataset File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\Default\STD Performance Check.492
MassCal File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Conditions File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Dual Detector Mode: Pulse
Acq. Dead Time (ns): 35
Current Dead Time (ns): 35
Torch Z position (mm): 0.00

Summary

	Analyte	Mass	Meas. Intens. Mean	Net Intens. Mean	Net Intens. SD	Net Intens. RSD	Mode
	Be	9.0	6579.4	6579.382	74.141	1.1	Standard
	In	114.9	72322.7	72322.705	1048.527	1.4	Standard
	U	238.1	90166.8	90166.795	437.626	0.5	Standard
⌈	CeO	155.9	1278.8	0.015	0.000	2.6	Standard
| >	Ce	139.9	87986.2	87986.212	900.182	1.0	Standard
⌊	Ce++	70.0	1159.8	0.013	0.001	3.9	Standard
	Bkgd	220.0	0.1	0.100	0.091	91.3	Standard

Current Conditions File Data

Current Value	Description
0.97	Nebulizer Gas Flow STD/KED [NEB]
1.20	Auxiliary Gas Flow
17.50	Plasma Gas Flow
-10.75	Deflector Voltage
1600.00	ICP RF Power
-1600.00	Analog Stage Voltage
1050.00	Pulse Stage Voltage
0.00	Quadrupole Rod Offset STD [QRO]
-10.00	Cell Rod Offset STD [CRO]
14.00	Discriminator Threshold
-5.00	Cell Entrance/Exit Voltage STD
0.00	RPa
0.45	RPq
0.97	DRC Mode NEB
-7.50	DRC Mode QRO
-2.00	DRC Mode CRO
-5.00	DRC Mode Cell Entrance/Exit Voltage
0.60	Cell Gas A
0.00	Cell Gas B
200.00	Axial Field Voltage
-11.00	KED Mode CRO
-12.00	KED Mode QRO
-11.00	KED Mode Cell Entrance Voltage
-33.00	KED Mode Cell Exit Voltage
0.00	KED Cell Gas A
3.00	KED Cell Gas B
0.00	KED RPa
0.25	KED RPq
125.00	KED Mode Axial Field Voltage

SmartTune Wizard - Summary

Optimization Summary

SmartTune file: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Wizard\SmartTune\ARISmartTuneDailyUCT.swz

Start Time: 7/14/2023 2:24:31 PM
End Time: 7/14/2023 2:35:26 PM

STD Performance Check - [Passed] Optimum value(s): N/A
Obtained Intensity (Be 9): 6899.00
Obtained Intensity (In 115): 66476.53
Obtained Intensity (U 238): 81652.48
Obtained Intensity (Bkgd 220): 0.63
Obtained Formula (Ce++ 70 / Ce 140): 0.013 (=1135.51 / 86414.28)
Obtained Formula (CeO 156 / Ce 140): 0.023 (=2013.94 / 86414.28)
Obtained RSD (Be 9): 0.0150
Obtained RSD (In 115): 0.0040
Obtained RSD (U 238): 0.0260

Torch Alignment - [Passed]

Vertical	Horizontal	Intensity
-0.44 mm	0.91 mm	82049.95

Nebulizer Gas Flow STD/KED [NEB] - [Passed] Optimum value(s): 0.97
Obtained Intensity (In 115): 75065.70
Obtained Formula (CeO 156 / Ce 140): 0.0211 (=2116.16 / 100216.29)

Mass Calibration and Resolution - [Passed] Optimum value(s): N/A
Target/Obtained mass (7.016/7.025), Target/Obtained resolution (0.7/0.712)
Target/Obtained mass (23.985/23.975), Target/Obtained resolution (0.7/0.720)
Target/Obtained mass (114.904/114.925), Target/Obtained resolution (0.7/0.720)
Target/Obtained mass (238.05/238.075), Target/Obtained resolution (0.7/0.723)

QID STD/DRC - Optimum value(s): Correlation Coefficient = 0.995; Intercept = -16.04

KED Mode QID - Optimum value(s): Correlation Coefficient = 0.998; Intercept = -14.64

STD Performance Check - [Passed] Optimum value(s): N/A
Obtained Intensity (Be 9): 6579.38
Obtained Intensity (In 115): 72322.71
Obtained Intensity (U 238): 90166.80
Obtained Intensity (Bkgd 220): 0.10
Obtained Formula (Ce++ 70 / Ce 140): 0.013 (=1159.85 / 87986.21)
Obtained Formula (CeO 156 / Ce 140): 0.015 (=1278.79 / 87986.21)
Obtained RSD (Be 9): 0.0113
Obtained RSD (In 115): 0.0145
Obtained RSD (U 238): 0.0049

SmartTune Wizard - Details

```
Optimization Details

SmartTune file: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Wizard\SmartTune\ARISmartTuneDailyUCT.swz

Optimization Status

Start Time: 7/14/2023 2:24:31 PM

STD Performance Check
        Optimization Settings:
                Method: STD Performance Check.mth.
                Intensity Criterion: Be 9 > 2000
                Intensity Criterion: In 115 > 40000
                Intensity Criterion: U 238 > 30000
                Intensity Criterion: Bkgd 220 <= 5
                Formula Criterion: Ce++ 70 / Ce 140 <= 0.03
                Formula Criterion: CeO 156 / Ce 140 <= 0.025
                RSD Criterion: Be 9.0122 < 0.05
                RSD Criterion: In 114.904 < 0.05
                RSD Criterion: U 238.05 < 0.05

        Optimization Results:
        Initial Try
                Obtained Intensity (Be 9): 6899.00
                Obtained Intensity (In 115): 66476.53
                Obtained Intensity (U 238): 81652.48
                Obtained Intensity (Bkgd 220): 0.63
                Obtained Formula (Ce++ 70 / Ce 140): 0.013 (=1135.51 / 86414.28)
                Obtained Formula (CeO 156 / Ce 140): 0.023 (=2013.94 / 86414.28)
                Obtained RSD (Be 9): 0.0150
                Obtained RSD (In 115): 0.0040
                Obtained RSD (U 238): 0.0260

[Passed]  Optimum value(s): N/A

Torch Alignment
        Optimization Settings:
                Method: Torch Alignment.mth.
                Intensity Criterion: In 115 Maximum

        Optimization Results:
                Vertical      Horizontal      Intensity
[Passed]        -0.44 mm     0.91 mm       82049.95

Nebulizer Gas Flow STD/KED [NEB]
        Optimization Settings:
                Method: Optimize.mth.
                        Initial Try - Start/End/Step: 0.97/1.01/0.01.
                Intensity Criterion: In 115 Maximum
                Formula Criterion: CeO 156 / Ce 140 <= 0.025

        Optimization Results:
        Initial Try

                Obtained Intensity (In 115): 75065.70
                Obtained Formula (CeO 156 / Ce 140): 0.0211 (=2116.16 / 100216.29)
[Passed]  Optimum value(s): 0.97
```

Mass Calibration and Resolution

Optimization Settings:

Method: Tuning.mth.

MassCal File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun

Iterations: 6

Target accuracy (+/- amu): 0.05 for Mass Cal. and 0.03 for Resolution

Peak height (%) for Res. Opt.: 10

Optimization Results:

Initial Try

Target/Obtained mass (7.016/7.025), Target/Obtained resolution (0.7/0.712)

Target/Obtained mass (23.985/23.975), Target/Obtained resolution (0.7/0.720)

Target/Obtained mass (114.904/114.925), Target/Obtained resolution (0.7/0.720)

Target/Obtained mass (238.05/238.075), Target/Obtained resolution (0.7/0.723)

[Passed] Optimum value(s): N/A

QID STD/DRC

Optimization Settings:

Method: QID Calibration.mth.

Initial Try - Start/End/Step: -20/0/0.5.

Optimization Results:

Initial Try

Optimum value(s): Correlation Coefficient = 0.995; Intercept = -16.04

Analyte	Mass	Points	DAC	MaxIntensity
Li	7	41	-15.5	31715.2
Mg	24	41	-15	43421.9
In	115	41	-11.5	76287.1
Ce	140	41	-11	99340.2
Pb	208	41	-6	32633.2
U	238	41	-5.5	98764.2

KED Mode QID

Optimization Settings:

Method: QID Calibration.mth.

Initial Try - Start/End/Step: -20/0/0.5.

Optimization Results:

Initial Try

Optimum value(s): Correlation Coefficient = 0.998; Intercept = -14.64

Analyte	Mass	Points	DAC	MaxIntensity
Li	7	41	-14.5	22762.1
Mg	24	41	-14.5	55102.1
In	115	41	-12	81387.2
Ce	140	41	-11	103107
Pb	208	41	-6	43345.7
U	238	41	-5	85752.6

STD Performance Check

Optimization Settings:

Method: STD Performance Check.mth.

Intensity Criterion: Be 9 > 2000

Intensity Criterion: In 115 > 40000

```
            Intensity Criterion: U 238 > 30000
            Intensity Criterion: Bkgd 220 <= 5
            Formula Criterion: Ce++ 70 / Ce 140 <= 0.03
            Formula Criterion: CeO 156 / Ce 140 <= 0.025
            RSD Criterion: Be 9.0122 < 0.05
            RSD Criterion: In 114.904 < 0.05
            RSD Criterion: U 238.05 < 0.05

        Optimization Results:
        Initial Try
            Obtained Intensity (Be 9): 6579.38
            Obtained Intensity (In 115): 72322.71
            Obtained Intensity (U 238): 90166.80
            Obtained Intensity (Bkgd 220): 0.10
            Obtained Formula (Ce++ 70 / Ce 140): 0.013 (=1159.85 / 87986.21)
            Obtained Formula (CeO 156 / Ce 140): 0.015 (=1278.79 / 87986.21)
            Obtained RSD (Be 9): 0.0113
            Obtained RSD (In 115): 0.0145
            Obtained RSD (U 238): 0.0049

[Passed]  Optimum value(s): N/A

End Time: 7/14/2023 2:35:26 PM
```

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:09:24
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L				27683	2	Standard
>	**Sc**	**45**		ug/L				558668	3	Standard
	Cr	**52**		ug/L				18378	3	Standard
	Cr	**53**		ug/L				93	22	Standard
	Mn	**55**		ug/L				486	6	Standard
>	**Ge**	**72**		ug/L				40490	1	KED
	Ni	**60**		ug/L				23	41	KED
	Ni	**62**		ug/L				4	65	KED
	Cu	**63**		ug/L				59	9	KED
	Cu	**65**		ug/L				22	9	KED
	Zn	**66**		ug/L				76	11	KED
	Zn	**67**		ug/L				13	55	KED
	As	**75**		ug/L				3	51	KED
	Kr	**83**		ug/L				38	31	Standard
>	**In-1**	**115**		ug/L				8744	2	KED
	Cd	**111**		ug/L				4	35	KED
	Cd	**114**		ug/L				4	22	KED
>	**Tb**	**159**		ug/L				117865	1	Standard
	Pb	**208**		ug/L				93	7	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:13:46
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27496	1	Standard
>	**Sc**	**45**		ug/L			558668	559640	4	Standard
	Cr	**52**	**0.500**	ug/L	0.079	15	18378	28352	0	Standard
	Cr	**53**	**0.500**	ug/L	0.017	3	93	1245	1	Standard
	Mn	**55**	**0.500**	ug/L	0.021	4	486	15107	2	Standard
>	**Ge**	**72**		ug/L			40490	41757	1	KED
	Ni	**60**	**0.500**	ug/L	0.037	7	23	738	5	KED
	Ni	**62**	**0.500**	ug/L	0.051	10	4	128	10	KED
	Cu	**63**	**0.500**	ug/L	0.031	6	59	2310	6	KED
	Cu	**65**	**0.500**	ug/L	0.015	2	22	1204	2	KED
	Zn	**66**	**6.000**	ug/L	0.148	2	76	3459	1	KED
	Zn	**67**	**6.000**	ug/L	0.267	4	13	578	4	KED
	As	**75**	**0.200**	ug/L	0.008	3	3	65	4	KED
	Kr	**83**		ug/L			38	48	12	Standard
>	**In-1**	**115**		ug/L			8744	8570	4	KED
	Cd	**111**	**0.100**	ug/L	0.046	45	4	25	38	KED
	Cd	**114**	**0.100**	ug/L	0.014	13	4	67	9	KED
>	**Tb**	**159**		ug/L			117865	116375	2	Standard
	Pb	**208**	**0.100**	ug/L	0.004	4	93	4581	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:18:09
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	33229	1	Standard
>	**Sc**	**45**		ug/L			558668	569180	1	Standard
	Cr	**52**	**10.000**	ug/L	0.176	1	18378	219974	2	Standard
	Cr	**53**	**9.999**	ug/L	0.438	4	93	22892	3	Standard
	Mn	**55**	**10.000**	ug/L	0.168	1	486	292426	0	Standard
>	**Ge**	**72**		ug/L			40490	39748	6	KED
	Ni	**60**	**10.003**	ug/L	0.784	7	23	15469	1	KED
	Ni	**62**	**10.002**	ug/L	0.687	6	4	2522	1	KED
	Cu	**63**	**10.002**	ug/L	0.798	7	59	45602	1	KED
	Cu	**65**	**10.001**	ug/L	0.737	7	22	23072	1	KED
	Zn	**66**	**10.201**	ug/L	0.574	5	76	5858	1	KED
	Zn	**67**	**10.285**	ug/L	1.165	11	13	1008	6	KED
	As	**75**	**10.000**	ug/L	0.691	6	3	3016	1	KED
	Kr	**83**		ug/L			38	55	5	Standard
>	**In-1**	**115**		ug/L			8744	8818	2	KED
	Cd	**111**	**10.000**	ug/L	0.405	4	4	2656	1	KED
	Cd	**114**	**10.000**	ug/L	0.561	5	4	6721	4	KED
>	**Tb**	**159**		ug/L			117865	120036	0	Standard
	Pb	**208**	**10.000**	ug/L	0.166	1	93	442799	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL4
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:22:45
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	31717	1	Standard
>	**Sc**	**45**		ug/L			558668	562631	2	Standard
	Cr	**52**	**19.920**	ug/L	0.202	1	18378	408518	1	Standard
	Cr	**53**	**20.122**	ug/L	0.468	2	93	46582	1	Standard
	Mn	**55**	**20.051**	ug/L	0.137	0	486	585170	1	Standard
>	**Ge**	**72**		ug/L			40490	40987	0	KED
	Ni	**60**	**19.783**	ug/L	0.620	3	23	30308	2	KED
	Ni	**62**	**19.710**	ug/L	0.427	2	4	4855	1	KED
	Cu	**63**	**19.749**	ug/L	0.113	0	59	88664	1	KED
	Cu	**65**	**19.853**	ug/L	0.478	2	22	46002	1	KED
	Zn	**66**	**19.846**	ug/L	0.555	2	76	11447	1	KED
	Zn	**67**	**19.902**	ug/L	0.486	2	13	1979	1	KED
	As	**75**	**19.864**	ug/L	0.315	1	3	6029	0	KED
	Kr	**83**		ug/L			38	57	18	Standard
>	**In-1**	**115**		ug/L			8744	8540	0	KED
	Cd	**111**	**19.987**	ug/L	0.505	2	4	5127	2	KED
	Cd	**114**	**20.096**	ug/L	0.504	2	4	13343	2	KED
>	**Tb**	**159**		ug/L			117865	120115	1	Standard
	Pb	**208**	**19.949**	ug/L	0.447	2	93	874654	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:27:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27186	4	Standard
>	**Sc**	**45**		ug/L			558668	584790	3	Standard
	Cr	**52**	**49.618**	ug/L	2.005	4	18378	990922	0	Standard
	Cr	**53**	**49.597**	ug/L	1.974	3	93	114490	0	Standard
	Mn	**55**	**49.524**	ug/L	2.566	5	486	1431630	1	Standard
>	**Ge**	**72**		ug/L			40490	41023	1	KED
	Ni	**60**	**49.657**	ug/L	1.310	2	23	73585	1	KED
	Ni	**62**	**49.627**	ug/L	0.389	0	4	11790	0	KED
	Cu	**63**	**49.586**	ug/L	1.270	2	59	213840	1	KED
	Cu	**65**	**49.500**	ug/L	1.562	3	22	109299	2	KED
	Zn	**66**	**49.486**	ug/L	0.720	1	76	27158	1	KED
	Zn	**67**	**49.218**	ug/L	1.716	3	13	4549	3	KED
	As	**75**	**49.662**	ug/L	1.214	2	3	14588	2	KED
	Kr	**83**		ug/L			38	54	11	Standard
>	**In-1**	**115**		ug/L			8744	8765	1	KED
	Cd	**111**	**49.620**	ug/L	0.684	1	4	12580	1	KED
	Cd	**114**	**49.685**	ug/L	0.276	0	4	32813	0	KED
>	**Tb**	**159**		ug/L			117865	119733	0	Standard
	Pb	**208**	**49.825**	ug/L	0.685	1	93	2140382	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL6
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:33:58
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	30505	1	Standard
>	**Sc**	**45**		ug/L			558668	542104	0	Standard
	Cr	**52**	**100.929**	ug/L	4.303	4	18378	1910490	4	Standard
	Cr	**53**	**101.254**	ug/L	2.863	2	93	226218	1	Standard
	Mn	**55**	**99.159**	ug/L	0.271	0	486	2587647	1	Standard
>	**Ge**	**72**		ug/L			40490	40655	0	KED
	Ni	**60**	**100.265**	ug/L	0.695	0	23	148555	0	KED
	Ni	**62**	**100.095**	ug/L	0.604	0	4	23639	0	KED
	Cu	**63**	**99.792**	ug/L	1.119	1	59	423571	1	KED
	Cu	**65**	**99.687**	ug/L	1.180	1	22	215905	1	KED
	Zn	**66**	**99.905**	ug/L	0.970	0	76	54090	1	KED
	Zn	**67**	**100.768**	ug/L	4.149	4	13	9454	4	KED
	As	**75**	**100.494**	ug/L	1.117	1	3	29743	1	KED
	Kr	**83**		ug/L			38	70	21	Standard
>	**In-1**	**115**		ug/L			8744	9046	0	KED
	Cd	**111**	**99.396**	ug/L	2.246	2	4	25491	1	KED
	Cd	**114**	**99.495**	ug/L	1.389	1	4	66690	1	KED
>	**Tb**	**159**		ug/L			117865	112803	1	Standard
	Pb	**208**	**99.909**	ug/L	1.119	1	93	4031113	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:41:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26794	1	Standard
>	**Sc**	**45**		ug/L			558668	543022	2	Standard
	Cr	**52**	**0.023**	ug/L	0.052	230	18378	18275	3	Standard
	Cr	**53**	**0.003**	ug/L	0.005	155	93	97	12	Standard
	Mn	**55**	**0.002**	ug/L	0.005	303	486	517	24	Standard
>	**Ge**	**72**		ug/L			40490	40485	3	KED
	Ni	**60**	**-0.004**	ug/L	0.006	149	23	17	50	KED
	Ni	**62**	**-0.003**	ug/L	0.008	275	4	3	50	KED
	Cu	**63**	**0.000**	ug/L	0.003	1093	59	60	22	KED
	Cu	**65**	**0.004**	ug/L	0.005	117	22	31	35	KED
	Zn	**66**	**0.006**	ug/L	0.021	334	76	79	11	KED
	Zn	**67**	**0.070**	ug/L	0.091	129	13	20	37	KED
	As	**75**	**0.009**	ug/L	0.000	3	3	6	4	KED
	Kr	**83**		ug/L			38	55	18	Standard
>	**In-1**	**115**		ug/L			8744	8985	1	KED
	Cd	**111**	**0.010**	ug/L	0.004	41	4	6	14	KED
	Cd	**114**	**0.001**	ug/L	0.003	327	4	5	34	KED
>	**Tb**	**159**		ug/L			117865	114474	1	Standard
	Pb	**208**	**0.004**	ug/L	0.004	91	93	267	59	Standard

Sample Information

Sample Date/Time: Friday, July 14, 2023 15:33:58
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.m
Mass Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Conditions File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

Calibration

Analyte	Mass	**r Corr Coef**	Slope	Std 1 Conc	Std 2 Conc	Std 3 Conc	Std 4 Conc	Std 5 Conc
C	13							
Sc	45							
Cr	52	**0.9998**	0.035	0.50	10	20	50	100
Cr	53	**0.9997**	0.004	0.50	10	20	50	100
Mn	55	**0.9998**	0.048	0.50	10	20	50	100
Ge	72							
Ni	60	**1.0000**	0.036	0.50	10	20	50	100
Ni	62	**0.9999**	0.006	0.50	10	20	50	100
Cu	63	**0.9999**	0.104	0.50	10	20	50	100
Cu	65	**0.9999**	0.053	0.50	10	20	50	100
Zn	66	**0.9999**	0.013	6.00	10	20	50	100
Zn	67	**0.9998**	0.002	6.00	10	20	50	100
As	75	**0.9999**	0.007	0.20	10	20	50	100
Kr	83							
In-1	115							
Cd	111	**0.9999**	0.028	0.10	10	20	50	100
Cd	114	**0.9999**	0.074	0.10	10	20	50	100
Tb	159							
Pb	208	**1.0000**	0.358	0.10	10	20	50	100

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-ICV1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:47:25
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	29400	3	Standard
>	**Sc**	**45**		ug/L			558668	540135	2	Standard
	Cr	**52**	**51.528**	ug/L	1.133	2	18378	980508	2	Standard
	Cr	**53**	**51.519**	ug/L	2.173	4	93	114701	3	Standard
	Mn	**55**	**53.150**	ug/L	0.717	1	486	1381892	1	Standard
>	**Ge**	**72**		ug/L			40490	40407	2	KED
	Ni	**60**	**51.639**	ug/L	0.490	0	23	76046	1	KED
	Ni	**62**	**53.553**	ug/L	1.572	2	4	12567	1	KED
	Cu	**63**	**52.150**	ug/L	1.096	2	59	219973	1	KED
	Cu	**65**	**52.986**	ug/L	1.101	2	22	114032	0	KED
	Zn	**66**	**51.145**	ug/L	1.751	3	76	27545	1	KED
	Zn	**67**	**48.972**	ug/L	1.197	2	13	4572	2	KED
	As	**75**	**48.660**	ug/L	1.081	2	3	14310	0	KED
	Kr	**83**		ug/L			38	57	27	Standard
>	**In-1**	**115**		ug/L			8744	8831	2	KED
	Cd	**111**	**51.231**	ug/L	0.596	1	4	12828	1	KED
	Cd	**114**	**51.573**	ug/L	1.500	2	4	33738	0	KED
>	**Tb**	**159**		ug/L			117865	114365	0	Standard
	Pb	**208**	**52.662**	ug/L	0.460	0	93	2154279	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-ICB1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 15:54:30

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	25964	2	Standard
>	**Sc**	**45**		ug/L			558668	538224	1	Standard
	Cr	**52**	**0.014**	ug/L	0.037	270	18378	17955	2	Standard
	Cr	**53**	**0.006**	ug/L	0.001	16	93	103	2	Standard
	Mn	**55**	**-0.003**	ug/L	0.001	56	486	402	8	Standard
>	**Ge**	**72**		ug/L			40490	40981	1	KED
	Ni	**60**	**-0.005**	ug/L	0.003	47	23	15	24	KED
	Ni	**62**	**-0.000**	ug/L	0.009	5420	4	4	49	KED
	Cu	**63**	**0.002**	ug/L	0.001	56	59	66	4	KED
	Cu	**65**	**0.009**	ug/L	0.004	51	22	41	22	KED
	Zn	**66**	**0.016**	ug/L	0.023	142	76	85	13	KED
	Zn	**67**	**0.045**	ug/L	0.091	203	13	18	47	KED
	As	**75**	**0.007**	ug/L	0.003	42	3	5	17	KED
	Kr	**83**		ug/L			38	49	7	Standard
>	**In-1**	**115**		ug/L			8744	8621	3	KED
	Cd	**111**	**0.082**	ug/L	0.134	163	4	24	137	KED
	Cd	**114**	**0.049**	ug/L	0.085	174	4	37	151	KED
>	**Tb**	**159**		ug/L			117865	112662	2	Standard
	Pb	**208**	**0.001**	ug/L	0.001	91	93	127	29	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-ICB1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:00:19
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26286	0	Standard
>	**Sc**	**45**		ug/L			558668	536382	0	Standard
	Cr	**52**	**-0.013**	ug/L	0.018	131	18378	17397	1	Standard
	Cr	**53**	**0.002**	ug/L	0.005	211	93	94	11	Standard
	Mn	**55**	**-0.001**	ug/L	0.001	286	486	453	8	Standard
>	**Ge**	**72**		ug/L			40490	40441	2	KED
	Ni	**60**	**-0.005**	ug/L	0.004	91	23	16	37	KED
	Ni	**62**	**-0.000**	ug/L	0.012	26007	4	4	65	KED
	Cu	**63**	**0.000**	ug/L	0.001	334	59	60	12	KED
	Cu	**65**	**0.007**	ug/L	0.005	67	22	37	28	KED
	Zn	**66**	**-0.008**	ug/L	0.012	148	76	71	11	KED
	Zn	**67**	**0.006**	ug/L	0.091	1503	13	14	60	KED
	As	**75**	**-0.004**	ug/L	0.004	96	3	2	44	KED
	Kr	**83**		ug/L			38	48	29	Standard
>	**In-1**	**115**		ug/L			8744	8970	2	KED
	Cd	**111**	**0.003**	ug/L	0.006	180	4	5	28	KED
	Cd	**114**	**0.002**	ug/L	0.003	208	4	6	37	KED
>	**Tb**	**159**		ug/L			117865	115564	2	Standard
	Pb	**208**	**0.001**	ug/L	0.000	36	93	117	9	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:04:42
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27330	1	Standard
>	**Sc**	**45**		ug/L			558668	547187	2	Standard
	Cr	**52**	**49.919**	ug/L	0.772	1	18378	962669	1	Standard
	Cr	**53**	**50.854**	ug/L	2.007	3	93	114663	1	Standard
	Mn	**55**	**53.768**	ug/L	2.926	5	486	1415245	3	Standard
>	**Ge**	**72**		ug/L			40490	40656	0	KED
	Ni	**60**	**49.101**	ug/L	1.257	2	23	72762	2	KED
	Ni	**62**	**49.908**	ug/L	0.880	1	4	11788	1	KED
	Cu	**63**	**49.587**	ug/L	0.931	1	59	210508	1	KED
	Cu	**65**	**50.146**	ug/L	1.893	3	22	108621	3	KED
	Zn	**66**	**49.149**	ug/L	1.808	3	76	26651	3	KED
	Zn	**67**	**48.809**	ug/L	0.535	1	13	4586	0	KED
	As	**75**	**49.517**	ug/L	0.243	0	3	14657	0	KED
	Kr	**83**		ug/L			38	60	14	Standard
>	**In-1**	**115**		ug/L			8744	8704	2	KED
	Cd	**111**	**51.623**	ug/L	1.243	2	4	12737	0	KED
	Cd	**114**	**50.707**	ug/L	1.092	2	4	32698	1	KED
>	**Tb**	**159**		ug/L			117865	114035	0	Standard
	Pb	**208**	**52.302**	ug/L	0.580	1	93	2133454	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:11:48

DEL

INT STD LINE DISCONNECTED

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	20239	4	Standard
>	**Sc**	**45**		ug/L			558668	255	11	Standard
	Cr	**52**	**1471.177**	ug/L	170.496	11	18378	12883	0	Standard
	Cr	**53**	**67.039**	ug/L	2.031	3	93	70	10	Standard
	Mn	**55**	**51.021**	ug/L	8.487	16	486	619	6	Standard
>	**Ge**	**72**		ug/L			40490	19	10	KED
	Ni	**60**	**22.041**	ug/L	12.068	54	23	15	54	KED
	Ni	**62**	**59.403**	ug/L	38.206	64	4	6	62	KED
	Cu	**63**	**20.977**	ug/L	6.048	28	59	42	38	KED
	Cu	**65**	**22.745**	ug/L	6.897	30	22	23	39	KED
	Zn	**66**	**228.740**	ug/L	12.113	5	76	57	5	KED
	Zn	**67**	**106.219**	ug/L	78.560	73	13	4	65	KED
	As	**75**	**31.916**	ug/L	2.102	6	3	4	16	KED
	Kr	**83**		ug/L			38	132	13	Standard
>	**In-1**	**115**		ug/L			8744	5	22	KED
	Cd	**111**	**35.968**	ug/L	33.799	93	4	4	75	KED
	Cd	**114**	**10.992**	ug/L	4.169	37	4	4	52	KED
>	**Tb**	**159**		ug/L			117865	3	69	Standard
	Pb	**208**	**159.043**	ug/L	83.281	52	93	137	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:17:10
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27507	2	Standard
>	**Sc**	**45**		ug/L			558668	547273	3	Standard
	Cr	**52**	**-0.011**	ug/L	0.032	291	18378	17781	0	Standard
	Cr	**53**	**0.003**	ug/L	0.002	52	93	98	3	Standard
	Mn	**55**	**-0.002**	ug/L	0.001	54	486	429	4	Standard
>	**Ge**	**72**		ug/L			40490	41794	1	KED
	Ni	**60**	**-0.003**	ug/L	0.002	63	23	19	17	KED
	Ni	**62**	**0.005**	ug/L	0.014	292	4	5	57	KED
	Cu	**63**	**0.000**	ug/L	0.004	2292	59	61	28	KED
	Cu	**65**	**0.006**	ug/L	0.004	64	22	36	23	KED
	Zn	**66**	**0.001**	ug/L	0.019	1323	76	79	12	KED
	Zn	**67**	**-0.077**	ug/L	0.061	79	13	6	83	KED
	As	**75**	**0.001**	ug/L	0.005	645	3	3	37	KED
	Kr	**83**		ug/L			38	46	14	Standard
>	**In-1**	**115**		ug/L			8744	9244	1	KED
	Cd	**111**	**0.009**	ug/L	0.007	75	4	6	24	KED
	Cd	**114**	**-0.003**	ug/L	0.006	175	4	2	132	KED
>	**Tb**	**159**		ug/L			117865	113063	0	Standard
	Pb	**208**	**0.001**	ug/L	0.001	51	93	134	16	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CRL1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:21:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27421	2	Standard
>	**Sc**	**45**		ug/L			558668	546162	0	Standard
	Cr	**52**	**0.520**	ug/L	0.022	4	18378	27783	1	Standard
	Cr	**53**	**0.514**	ug/L	0.024	4	93	1247	4	Standard
	Mn	**55**	**0.536**	ug/L	0.005	0	486	14576	0	Standard
>	**Ge**	**72**		ug/L			40490	39661	1	KED
	Ni	**60**	**0.495**	ug/L	0.025	5	23	739	6	KED
	Ni	**62**	**0.593**	ug/L	0.075	12	4	140	12	KED
	Cu	**63**	**0.518**	ug/L	0.010	1	59	2203	2	KED
	Cu	**65**	**0.549**	ug/L	0.018	3	22	1182	2	KED
	Zn	**66**	**6.271**	ug/L	0.226	3	76	3381	2	KED
	Zn	**67**	**5.556**	ug/L	0.346	6	13	521	5	KED
	As	**75**	**0.214**	ug/L	0.004	1	3	64	0	KED
	Kr	**83**		ug/L			38	46	15	Standard
>	**In-1**	**115**		ug/L			8744	8910	2	KED
	Cd	**111**	**0.101**	ug/L	0.026	26	4	29	20	KED
	Cd	**114**	**0.091**	ug/L	0.005	5	4	65	7	KED
>	**Tb**	**159**		ug/L			117865	113071	2	Standard
	Pb	**208**	**0.112**	ug/L	0.006	5	93	4607	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IFA1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:27:06

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	121852	1	Standard
>	**Sc**	**45**		ug/L			558668	559945	2	Standard
	Cr	**52**	**0.765**	ug/L	0.059	7	18378	33229	1	Standard
	Cr	**53**	**4.451**	ug/L	0.136	3	93	10357	1	Standard
	Mn	**55**	**0.099**	ug/L	0.005	4	486	3152	2	Standard
>	**Ge**	**72**		ug/L			40490	38685	10	KED
	Ni	**60**	**0.111**	ug/L	0.014	12	23	178	13	KED
	Ni	**62**	**0.176**	ug/L	0.009	4	4	43	8	KED
	Cu	**63**	**0.030**	ug/L	0.005	15	59	179	14	KED
	Cu	**65**	**0.037**	ug/L	0.009	24	22	97	27	KED
	Zn	**66**	**0.206**	ug/L	0.078	37	76	175	10	KED
	Zn	**67**	**0.210**	ug/L	0.056	26	13	31	9	KED
	As	**75**	**0.032**	ug/L	0.008	25	3	12	11	KED
	Kr	**83**		ug/L			38	115	3	Standard
>	**In-1**	**115**		ug/L			8744	9011	1	KED
	Cd	**111**	**0.084**	ug/L	0.014	16	4	25	13	KED
	Cd	**114**	**0.046**	ug/L	0.017	37	4	35	32	KED
>	**Tb**	**159**		ug/L			117865	109912	0	Standard
	Pb	**208**	**0.025**	ug/L	0.001	3	93	1073	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IFB1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:31:29
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	115688	2	Standard
>	**Sc**	**45**		ug/L			558668	562715	3	Standard
	Cr	**52**	**20.264**	ug/L	0.535	2	18378	412758	0	Standard
	Cr	**53**	**23.374**	ug/L	0.163	0	93	54280	2	Standard
	Mn	**55**	**20.668**	ug/L	0.926	4	486	559761	2	Standard
>	**Ge**	**72**		ug/L			40490	39197	3	KED
	Ni	**60**	**19.998**	ug/L	1.250	6	23	28550	3	KED
	Ni	**62**	**20.195**	ug/L	1.216	6	4	4595	2	KED
	Cu	**63**	**19.995**	ug/L	0.244	1	59	81850	2	KED
	Cu	**65**	**19.827**	ug/L	0.688	3	22	41388	1	KED
	Zn	**66**	**19.066**	ug/L	0.543	2	76	10005	1	KED
	Zn	**67**	**16.778**	ug/L	0.307	1	13	1528	1	KED
	As	**75**	**20.159**	ug/L	0.675	3	3	5750	1	KED
	Kr	**83**		ug/L			38	107	4	Standard
>	**In-1**	**115**		ug/L			8744	8498	1	KED
	Cd	**111**	**19.926**	ug/L	0.283	1	4	4804	2	KED
	Cd	**114**	**19.681**	ug/L	0.090	0	4	12397	1	KED
>	**Tb**	**159**		ug/L			117865	112195	1	Standard
	Pb	**208**	**0.023**	ug/L	0.002	7	93	1015	4	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-HCV1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:35:51
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	31340	5	Standard
>	**Sc**	**45**		ug/L			558668	525180	2	Standard
	Cr	**52**	**185.783**	ug/L	5.759	3	18378	3391289	1	Standard
	Cr	**53**	**199.809**	ug/L	4.675	2	93	432306	0	Standard
	Mn	**55**	**196.997**	ug/L	3.587	1	486	4978578	0	Standard
>	**Ge**	**72**		ug/L			40490	39927	1	KED
	Ni	**60**	**196.522**	ug/L	1.724	0	23	285927	1	KED
	Ni	**62**	**202.036**	ug/L	4.601	2	4	46845	0	KED
	Cu	**63**	**194.422**	ug/L	4.475	2	59	810320	2	KED
	Cu	**65**	**200.405**	ug/L	6.947	3	22	426146	2	KED
	Zn	**66**	**199.974**	ug/L	3.876	1	76	106242	1	KED
	Zn	**67**	**190.623**	ug/L	1.603	0	13	17554	2	KED
	As	**75**	**203.027**	ug/L	4.022	1	3	59006	1	KED
	Kr	**83**		ug/L			38	116	5	Standard
>	**In-1**	**115**		ug/L			8744	8881	1	KED
	Cd	**111**	**199.117**	ug/L	2.404	1	4	50127	0	KED
	Cd	**114**	**196.917**	ug/L	1.198	0	4	129578	1	KED
>	**Tb**	**159**		ug/L			117865	106687	1	Standard
	Pb	**208**	**199.867**	ug/L	4.720	2	93	7625329	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-HCV2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:40:13
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	32554	4	Standard
>	**Sc**	**45**		ug/L			558668	535299	1	Standard
	Cr	**52**	**264.255**	ug/L	5.195	1	18378	4911065	2	Standard
	Cr	**53**	**289.231**	ug/L	1.989	0	93	637989	1	Standard
	Mn	**55**	**281.995**	ug/L	7.452	2	486	7263912	1	Standard
>	**Ge**	**72**		ug/L			40490	37318	1	KED
	Ni	**60**	**296.937**	ug/L	2.133	0	23	403789	0	KED
	Ni	**62**	**303.049**	ug/L	3.472	1	4	65689	1	KED
	Cu	**63**	**290.429**	ug/L	1.980	0	59	1131397	0	KED
	Cu	**65**	**294.102**	ug/L	6.888	2	22	584650	2	KED
	Zn	**66**	**285.268**	ug/L	3.733	1	76	141652	2	KED
	Zn	**67**	**280.866**	ug/L	1.413	0	13	24165	0	KED
	As	**75**	**302.470**	ug/L	2.456	0	3	82168	1	KED
	Kr	**83**		ug/L			38	192	6	Standard
>	**In-1**	**115**		ug/L			8744	8140	4	KED
	Cd	**111**	**297.213**	ug/L	11.001	3	4	68520	0	KED
	Cd	**114**	**300.381**	ug/L	10.837	3	4	181002	0	KED
>	**Tb**	**159**		ug/L			117865	102070	1	Standard
	Pb	**208**	**290.597**	ug/L	6.395	2	93	10607533	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:47:18
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	31081	2	Standard
>	**Sc**	**45**		ug/L			558668	554912	0	Standard
	Cr	**52**	**0.007**	ug/L	0.017	242	18378	18387	2	Standard
	Cr	**53**	**0.029**	ug/L	0.008	26	93	160	10	Standard
	Mn	**55**	**0.004**	ug/L	0.001	21	486	585	4	Standard
>	**Ge**	**72**		ug/L			40490	43827	2	KED
	Ni	**60**	**-0.000**	ug/L	0.004	12124	23	25	24	KED
	Ni	**62**	**0.008**	ug/L	0.011	130	4	6	41	KED
	Cu	**63**	**0.007**	ug/L	0.002	22	59	97	7	KED
	Cu	**65**	**0.010**	ug/L	0.003	28	22	46	11	KED
	Zn	**66**	**-0.016**	ug/L	0.009	55	76	73	5	KED
	Zn	**67**	**0.014**	ug/L	0.063	437	13	16	37	KED
	As	**75**	**0.017**	ug/L	0.002	9	3	8	6	KED
	Kr	**83**		ug/L			38	50	26	Standard
>	**In-1**	**115**		ug/L			8744	9798	1	KED
	Cd	**111**	**0.007**	ug/L	0.009	120	4	6	37	KED
	Cd	**114**	**0.003**	ug/L	0.005	193	4	7	50	KED
>	**Tb**	**159**		ug/L			117865	116336	1	Standard
	Pb	**208**	**0.008**	ug/L	0.001	16	93	443	12	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IFA1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:53:35
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	120458	1	Standard
>	**Sc**	**45**		ug/L			558668	578896	1	Standard
	Cr	**52**	**0.727**	ug/L	0.068	9	18378	33582	2	Standard
	Cr	**53**	**4.319**	ug/L	0.101	2	93	10397	1	Standard
	Mn	**55**	**0.100**	ug/L	0.002	1	486	3291	1	Standard
>	**Ge**	**72**		ug/L			40490	43682	2	KED
	Ni	**60**	**0.079**	ug/L	0.006	7	23	151	6	KED
	Ni	**62**	**0.126**	ug/L	0.002	1	4	36	2	KED
	Cu	**63**	**0.027**	ug/L	0.004	13	59	185	11	KED
	Cu	**65**	**0.035**	ug/L	0.010	28	22	104	19	KED
	Zn	**66**	**0.163**	ug/L	0.020	12	76	176	4	KED
	Zn	**67**	**0.191**	ug/L	0.052	27	13	34	16	KED
	As	**75**	**0.036**	ug/L	0.015	41	3	14	31	KED
	Kr	**83**		ug/L			38	104	14	Standard
>	**In-1**	**115**		ug/L			8744	9648	3	KED
	Cd	**111**	**0.070**	ug/L	0.027	38	4	23	34	KED
	Cd	**114**	**0.047**	ug/L	0.008	16	4	39	12	KED
>	**Tb**	**159**		ug/L			117865	113554	0	Standard
	Pb	**208**	**0.027**	ug/L	0.001	2	93	1181	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 16:57:57
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	29417	4	Standard
>	**Sc**	**45**		ug/L			558668	538831	2	Standard
	Cr	**52**	**0.008**	ug/L	0.026	318	18378	17871	1	Standard
	Cr	**53**	**0.151**	ug/L	0.005	3	93	425	0	Standard
	Mn	**55**	**0.004**	ug/L	0.001	16	486	580	3	Standard
>	**Ge**	**72**		ug/L			40490	43442	1	KED
	Ni	**60**	**-0.001**	ug/L	0.006	407	23	22	38	KED
	Ni	**62**	**-0.009**	ug/L	0.011	129	4	2	114	KED
	Cu	**63**	**0.002**	ug/L	0.003	140	59	73	20	KED
	Cu	**65**	**0.000**	ug/L	0.002	1610	22	24	19	KED
	Zn	**66**	**0.007**	ug/L	0.002	27	76	85	2	KED
	Zn	**67**	**0.003**	ug/L	0.021	784	13	15	12	KED
	As	**75**	**0.004**	ug/L	0.005	123	3	4	33	KED
	Kr	**83**		ug/L			38	50	9	Standard
>	**In-1**	**115**		ug/L			8744	9357	2	KED
	Cd	**111**	**0.010**	ug/L	0.004	39	4	6	15	KED
	Cd	**114**	**-0.000**	ug/L	0.006	1383	4	4	80	KED
>	**Tb**	**159**		ug/L			117865	114948	0	Standard
	Pb	**208**	**0.006**	ug/L	0.001	12	93	340	9	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:03:25
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26562	2	Standard
>	**Sc**	**45**		ug/L			558668	547678	0	Standard
	Cr	**52**	**49.337**	ug/L	0.179	0	18378	952755	0	Standard
	Cr	**53**	**48.992**	ug/L	1.367	2	93	110638	2	Standard
	Mn	**55**	**52.317**	ug/L	0.842	1	486	1379570	2	Standard
>	**Ge**	**72**		ug/L			40490	41889	2	KED
	Ni	**60**	**48.032**	ug/L	0.927	1	23	73331	2	KED
	Ni	**62**	**50.371**	ug/L	0.292	0	4	12258	1	KED
	Cu	**63**	**50.190**	ug/L	0.655	1	59	219503	1	KED
	Cu	**65**	**49.471**	ug/L	0.795	1	22	110411	2	KED
	Zn	**66**	**49.854**	ug/L	0.379	0	76	27848	1	KED
	Zn	**67**	**49.738**	ug/L	1.228	2	13	4816	3	KED
	As	**75**	**48.770**	ug/L	0.729	1	3	14871	0	KED
	Kr	**83**		ug/L			38	60	11	Standard
>	**In-1**	**115**		ug/L			8744	8991	4	KED
	Cd	**111**	**51.548**	ug/L	2.755	5	4	13124	1	KED
	Cd	**114**	**50.891**	ug/L	2.002	3	4	33874	1	KED
>	**Tb**	**159**		ug/L			117865	115102	0	Standard
	Pb	**208**	**49.005**	ug/L	0.615	1	93	2017706	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:10:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26065	5	Standard
>	**Sc**	**45**		ug/L			558668	544691	1	Standard
	Cr	**52**	**-0.028**	ug/L	0.020	70	18378	17387	1	Standard
	Cr	**53**	**0.037**	ug/L	0.010	26	93	173	11	Standard
	Mn	**55**	**0.000**	ug/L	0.001	4148	486	474	6	Standard
>	**Ge**	**72**		ug/L			40490	41647	0	KED
	Ni	**60**	**0.003**	ug/L	0.005	205	23	27	27	KED
	Ni	**62**	**0.002**	ug/L	0.004	211	4	5	21	KED
	Cu	**63**	**0.003**	ug/L	0.003	89	59	74	16	KED
	Cu	**65**	**0.008**	ug/L	0.002	20	22	40	9	KED
	Zn	**66**	**-0.009**	ug/L	0.029	303	76	73	21	KED
	Zn	**67**	**-0.011**	ug/L	0.018	169	13	13	14	KED
	As	**75**	**0.007**	ug/L	0.005	65	3	5	26	KED
	Kr	**83**		ug/L			38	55	31	Standard
>	**In-1**	**115**		ug/L			8744	9292	1	KED
	Cd	**111**	**0.005**	ug/L	0.004	69	4	5	16	KED
	Cd	**114**	**-0.001**	ug/L	0.003	548	4	4	46	KED
>	**Tb**	**159**		ug/L			117865	112933	1	Standard
	Pb	**208**	**0.002**	ug/L	0.000	16	93	173	7	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0245-BLK2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:15:39
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	39895	4	Standard
>	**Sc**	**45**		ug/L			558668	553080	1	Standard
	Cr	**52**	**0.043**	ug/L	0.020	45	18378	19004	0	Standard
	Cr	**53**	**0.058**	ug/L	0.011	18	93	224	9	Standard
	Mn	**55**	**0.110**	ug/L	0.001	1	486	3396	2	Standard
>	**Ge**	**72**		ug/L			40490	43171	2	KED
	Ni	**60**	**-0.000**	ug/L	0.003	1485	23	24	20	KED
	Ni	**62**	**-0.001**	ug/L	0.009	842	4	4	49	KED
	Cu	**63**	**0.090**	ug/L	0.005	5	59	467	3	KED
	Cu	**65**	**0.086**	ug/L	0.006	7	22	221	4	KED
	Zn	**66**	**0.675**	ug/L	0.021	3	76	469	5	KED
	Zn	**67**	**0.596**	ug/L	0.066	11	13	74	11	KED
	As	**75**	**0.002**	ug/L	0.005	228	3	4	40	KED
	Kr	**83**		ug/L			38	53	17	Standard
>	**In-1**	**115**		ug/L			8744	9057	2	KED
	Cd	**111**	**0.003**	ug/L	0.006	177	4	5	28	KED
	Cd	**114**	**0.005**	ug/L	0.001	26	4	8	12	KED
>	**Tb**	**159**		ug/L			117865	114455	0	Standard
	Pb	**208**	**0.005**	ug/L	0.000	4	93	309	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0245-BS2
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:20:01
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	45405	2	Standard
>	**Sc**	**45**		ug/L			558668	554921	1	Standard
	Cr	**52**	**24.044**	ug/L	0.114	0	18378	479824	1	Standard
	Cr	**53**	**23.800**	ug/L	0.711	2	93	54526	4	Standard
	Mn	**55**	**26.003**	ug/L	0.614	2	486	694815	0	Standard
>	**Ge**	**72**		ug/L			40490	41980	1	KED
	Ni	**60**	**25.192**	ug/L	0.159	0	23	38559	1	KED
	Ni	**62**	**25.176**	ug/L	0.602	2	4	6142	2	KED
	Cu	**63**	**25.055**	ug/L	0.273	1	59	109856	1	KED
	Cu	**65**	**25.687**	ug/L	0.434	1	22	57460	1	KED
	Zn	**66**	**80.874**	ug/L	2.460	3	76	45218	1	KED
	Zn	**67**	**73.411**	ug/L	1.220	1	13	7116	2	KED
	As	**75**	**24.923**	ug/L	0.063	0	3	7619	1	KED
	Kr	**83**		ug/L			38	50	5	Standard
>	**In-1**	**115**		ug/L			8744	9114	1	KED
	Cd	**111**	**25.595**	ug/L	1.023	3	4	6615	3	KED
	Cd	**114**	**25.143**	ug/L	0.630	2	4	16979	0	KED
>	**Tb**	**159**		ug/L			117865	113480	2	Standard
	Pb	**208**	**24.923**	ug/L	0.950	3	93	1011226	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0268-BLK1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:24:23
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			27683	36688	3	Standard
>	Sc	45		ug/L			558668	542067	2	Standard
	Cr	52	0.065	ug/L	0.036	55	18378	19047	2	Standard
	Cr	53	0.045	ug/L	0.002	4	93	191	4	Standard
	Mn	55	0.050	ug/L	0.002	3	486	1775	1	Standard
>	Ge	72		ug/L			40490	40308	2	KED
	Ni	60	-0.001	ug/L	0.008	659	23	21	51	KED
	Ni	62	-0.008	ug/L	0.013	159	4	2	114	KED
	Cu	63	0.040	ug/L	0.003	8	59	229	7	KED
	Cu	65	0.048	ug/L	0.003	5	22	125	6	KED
	Zn	66	0.395	ug/L	0.056	14	76	287	11	KED
	Zn	67	0.317	ug/L	0.237	74	13	43	49	KED
	As	75	0.005	ug/L	0.005	84	3	4	27	KED
	Kr	83		ug/L			38	33	43	Standard
>	In-1	115		ug/L			8744	9096	1	KED
	Cd	111	0.006	ug/L	0.004	68	4	5	16	KED
	Cd	114	-0.000	ug/L	0.006	1629	4	4	85	KED
>	Tb	159		ug/L			117865	113944	0	Standard
	Pb	208	0.007	ug/L	0.003	38	93	368	29	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0268-BS1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:28:46
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			27683	36674	5	Standard
>	Sc	45		ug/L			558668	548982	5	Standard
	Cr	52	24.849	ug/L	1.790	7	18378	488688	1	Standard
	Cr	53	24.027	ug/L	1.353	5	93	54328	1	Standard
	Mn	55	25.824	ug/L	1.585	6	486	681235	0	Standard
>	Ge	72		ug/L			40490	41353	1	KED
	Ni	60	24.360	ug/L	0.366	1	23	36732	2	KED
	Ni	62	24.645	ug/L	0.673	2	4	5921	1	KED
	Cu	63	24.895	ug/L	0.321	1	59	107542	2	KED
	Cu	65	25.030	ug/L	0.564	2	22	55162	3	KED
	Zn	66	78.623	ug/L	0.902	1	76	43313	1	KED
	Zn	67	74.036	ug/L	1.539	2	13	7070	3	KED
	As	75	24.310	ug/L	0.033	0	3	7321	1	KED
	Kr	83		ug/L			38	50	17	Standard
>	In-1	115		ug/L			8744	8764	2	KED
	Cd	111	26.105	ug/L	0.459	1	4	6488	0	KED
	Cd	114	25.428	ug/L	0.429	1	4	16513	0	KED
>	Tb	159		ug/L			117865	113643	2	Standard
	Pb	208	24.666	ug/L	0.883	3	93	1002228	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23G0246-01
Sample Dil Factor: 2
Comments:
Sample Date/Time: Friday, July 14, 2023 17:33:08

DEL

INT STD LINE DISCONNECTED

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	308042	3	Standard
>	**Sc**	**45**		ug/L			558668	3877	1	Standard
	Cr	**52**	**351.416**	ug/L	10.019	2	18378	47250	1	Standard
	Cr	**53**	**154.219**	ug/L	2.014	1	93	2464	1	Standard
	Mn	**55**	**15418.461**	ug/L	560.667	3	486	2876331	2	Standard
>	**Ge**	**72**		ug/L			40490	45	19	KED
	Ni	**60**	**8343.108**	ug/L	1532.786	18	23	13377	0	KED
	Ni	**62**	**8680.442**	ug/L	1588.738	18	4	2218	0	KED
	Cu	**63**	**5246.321**	ug/L	956.266	18	59	24106	2	KED
	Cu	**65**	**5356.950**	ug/L	956.913	17	22	12565	1	KED
	Zn	**66**	**19181.326**	ug/L	3155.166	16	76	11255	2	KED
	Zn	**67**	**18910.069**	ug/L	4034.411	21	13	1911	5	KED
	As	**75**	**127.666**	ug/L	30.450	23	3	40	8	KED
	Kr	**83**		ug/L			38	142	13	Standard
>	**In-1**	**115**		ug/L			8744	3	28	KED
	Cd	**111**	**240.424**	ug/L	114.544	47	4	23	13	KED
	Cd	**114**	**137.090**	ug/L	39.883	29	4	36	32	KED
>	**Tb**	**159**		ug/L			117865	12	18	Standard
	Pb	**208**	**8347.042**	ug/L	1589.196	19	93	35184	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23G0246-01
Sample Dil Factor: 2
Comments:
Sample Date/Time: Friday, July 14, 2023 17:39:37
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			27683	358334	3	Standard
>	Sc	45		ug/L			558668	523714	0	Standard
	Cr	52	2.114	ug/L	0.060	2	18378	55532	2	Standard
	Cr	53	1.182	ug/L	0.042	3	93	2638	3	Standard
	Mn	55	121.790	ug/L	2.706	2	486	3070217	2	Standard
>	Ge	72		ug/L			40490	37118	2	KED
	Ni	60	10.501	ug/L	0.300	2	23	14218	1	KED
	Ni	62	10.785	ug/L	0.145	1	4	2328	1	KED
	Cu	63	6.429	ug/L	0.162	2	59	24954	2	KED
	Cu	65	6.478	ug/L	0.263	4	22	12820	2	KED
	Zn	66	23.402	ug/L	0.906	3	76	11613	1	KED
	Zn	67	22.524	ug/L	1.860	8	13	1936	5	KED
	As	75	0.147	ug/L	0.016	10	3	42	12	KED
	Kr	83		ug/L			38	74	12	Standard
>	In-1	115		ug/L			8744	8618	3	KED
	Cd	111	0.065	ug/L	0.008	11	4	20	9	KED
	Cd	114	0.047	ug/L	0.017	35	4	34	28	KED
>	Tb	159		ug/L			117865	104631	1	Standard
	Pb	208	0.858	ug/L	0.014	1	93	32173	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL4
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:44:31
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	37710	2	Standard
>	**Sc**	**45**		ug/L			558668	528901	1	Standard
	Cr	**52**	**0.057**	ug/L	0.027	47	18378	18436	3	Standard
	Cr	**53**	**0.028**	ug/L	0.005	18	93	149	7	Standard
	Mn	**55**	**0.013**	ug/L	0.018	139	486	780	56	Standard
>	**Ge**	**72**		ug/L			40490	40568	2	KED
	Ni	**60**	**0.004**	ug/L	0.012	337	23	28	59	KED
	Ni	**62**	**0.008**	ug/L	0.017	208	4	6	62	KED
	Cu	**63**	**0.008**	ug/L	0.007	91	59	93	31	KED
	Cu	**65**	**0.009**	ug/L	0.011	128	22	41	58	KED
	Zn	**66**	**0.041**	ug/L	0.020	47	76	98	8	KED
	Zn	**67**	**0.020**	ug/L	0.043	214	13	15	24	KED
	As	**75**	**0.001**	ug/L	0.002	180	3	3	15	KED
	Kr	**83**		ug/L			38	43	8	Standard
>	**In-1**	**115**		ug/L			8744	8683	1	KED
	Cd	**111**	**0.008**	ug/L	0.015	198	4	6	63	KED
	Cd	**114**	**0.005**	ug/L	0.004	91	4	7	36	KED
>	**Tb**	**159**		ug/L			117865	107722	0	Standard
	Pb	**208**	**0.008**	ug/L	0.001	9	93	386	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:48:54
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	29395	3	Standard
>	**Sc**	**45**		ug/L			558668	525057	3	Standard
	Cr	**52**	**49.319**	ug/L	2.464	4	18378	912187	2	Standard
	Cr	**53**	**49.215**	ug/L	1.813	3	93	106532	4	Standard
	Mn	**55**	**52.435**	ug/L	2.071	3	486	1324523	2	Standard
>	**Ge**	**72**		ug/L			40490	40553	1	KED
	Ni	**60**	**48.341**	ug/L	0.500	1	23	71451	0	KED
	Ni	**62**	**49.349**	ug/L	1.963	3	4	11625	3	KED
	Cu	**63**	**49.527**	ug/L	0.848	1	59	209729	2	KED
	Cu	**65**	**49.528**	ug/L	0.238	0	22	107017	1	KED
	Zn	**66**	**49.918**	ug/L	0.791	1	76	26994	1	KED
	Zn	**67**	**49.247**	ug/L	1.097	2	13	4617	3	KED
	As	**75**	**49.616**	ug/L	1.475	2	3	14646	1	KED
	Kr	**83**		ug/L			38	41	20	Standard
>	**In-1**	**115**		ug/L			8744	8907	3	KED
	Cd	**111**	**50.009**	ug/L	1.794	3	4	12620	0	KED
	Cd	**114**	**50.090**	ug/L	2.424	4	4	33023	1	KED
>	**Tb**	**159**		ug/L			117865	109993	3	Standard
	Pb	**208**	**50.112**	ug/L	1.447	2	93	1970731	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 17:56:01
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26583	1	Standard
>	**Sc**	**45**		ug/L			558668	534578	0	Standard
	Cr	**52**	**-0.009**	ug/L	0.034	362	18378	17412	4	Standard
	Cr	**53**	**0.010**	ug/L	0.007	67	93	111	13	Standard
	Mn	**55**	**-0.001**	ug/L	0.001	92	486	435	5	Standard
>	**Ge**	**72**		ug/L			40490	41620	3	KED
	Ni	**60**	**-0.003**	ug/L	0.003	115	23	19	22	KED
	Ni	**62**	**-0.000**	ug/L	0.013	3823	4	4	65	KED
	Cu	**63**	**0.004**	ug/L	0.004	116	59	76	21	KED
	Cu	**65**	**0.007**	ug/L	0.007	93	22	39	41	KED
	Zn	**66**	**-0.017**	ug/L	0.016	93	76	69	13	KED
	Zn	**67**	**-0.017**	ug/L	0.023	135	13	12	17	KED
	As	**75**	**0.007**	ug/L	0.007	101	3	5	35	KED
	Kr	**83**		ug/L			38	37	10	Standard
>	**In-1**	**115**		ug/L			8744	9077	2	KED
	Cd	**111**	**0.014**	ug/L	0.015	105	4	7	48	KED
	Cd	**114**	**0.004**	ug/L	0.002	37	4	8	13	KED
>	**Tb**	**159**		ug/L			117865	110355	0	Standard
	Pb	**208**	**0.002**	ug/L	0.000	16	93	176	9	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0243-BLK1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:01:46
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	32902	3	Standard
	Kr	**83**		ug/L			38	60	4	Standard
>	**In-1**	**115**		ug/L			8744	8997	0	KED
	Cd	**111**	**0.005**	ug/L	0.012	253	4	5	53	KED
	Cd	**114**	**0.003**	ug/L	0.006	216	4	6	58	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0243-BS1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:05:13
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	31816	1	Standard
	Kr	**83**		ug/L			38	48	6	Standard
>	**In-1**	**115**		ug/L			8744	8852	2	KED
	Cd	**111**	**26.036**	ug/L	0.461	1	4	6536	1	KED
	Cd	**114**	**26.519**	ug/L	0.384	1	4	17395	1	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0243-BSD1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:08:40
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	31954	1	Standard
	Kr	**83**		ug/L			38	59	12	Standard
>	**In-1**	**115**		ug/L			8744	8371	1	KED
	Cd	**111**	**26.509**	ug/L	0.260	0	4	6295	2	KED
	Cd	**114**	**25.945**	ug/L	0.903	3	4	16093	2	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0286-05RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:12:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	34602	2	Standard
	Kr	**83**		ug/L			38	75	13	Standard
>	**In-1**	**115**		ug/L			8744	7542	2	KED
	Cd	**111**	**0.017**	ug/L	0.010	60	4	7	32	KED
	Cd	**114**	**0.023**	ug/L	0.006	24	4	16	19	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0286-11RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:15:36
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	35006	2	Standard
	Kr	**83**		ug/L			38	69	4	Standard
>	**In-1**	**115**		ug/L			8744	7748	2	KED
	Cd	**111**	**0.039**	ug/L	0.021	52	4	12	38	KED
	Cd	**114**	**0.034**	ug/L	0.014	43	4	23	37	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-06RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:19:07
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	37964	1	Standard
	Kr	**83**		ug/L			38	51	20	Standard
>	**In-1**	**115**		ug/L			8744	8705	0	KED
	Cd	**111**	**0.190**	ug/L	0.070	36	4	51	34	KED
	Cd	**114**	**0.159**	ug/L	0.042	26	4	107	25	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-08RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:22:33
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	34759	2	Standard
	Kr	**83**		ug/L			38	45	15	Standard
>	**In-1**	**115**		ug/L			8744	8586	3	KED
	Cd	**111**	**0.025**	ug/L	0.003	10	4	10	5	KED
	Cd	**114**	**0.018**	ug/L	0.013	74	4	15	50	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-09RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:26:21
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	35576	2	Standard
	Kr	**83**		ug/L			38	44	32	Standard
>	**In-1**	**115**		ug/L			8744	8860	1	KED
	Cd	**111**	**0.009**	ug/L	0.005	63	4	6	22	KED
	Cd	**114**	**0.003**	ug/L	0.002	55	4	7	15	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-11RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:29:47
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	39123	4	Standard
	Kr	**83**		ug/L			38	55	15	Standard
>	**In-1**	**115**		ug/L			8744	8882	1	KED
	Cd	**111**	**0.131**	ug/L	0.047	36	4	37	31	KED
	Cd	**114**	**0.121**	ug/L	0.018	14	4	84	12	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:33:15
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	26767	4	Standard
	Kr	**83**		ug/L			38	71	8	Standard
>	**In-1**	**115**		ug/L			8744	8513	4	KED
	Cd	**111**	**0.014**	ug/L	0.003	24	4	7	15	KED
	Cd	**114**	**-0.001**	ug/L	0.001	151	4	4	26	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV4
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:36:42
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	25106	0	Standard
	Kr	**83**		ug/L			38	41	12	Standard
>	**In-1**	**115**		ug/L			8744	8315	0	KED
	Cd	**111**	**51.119**	ug/L	1.152	2	4	12054	2	KED
	Cd	**114**	**50.686**	ug/L	0.615	1	4	31233	0	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB4
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:42:52

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	23710	2	Standard
	Kr	**83**		ug/L			38	53	3	Standard
>	**In-1**	**115**		ug/L			8744	8789	3	KED
	Cd	**111**	**0.090**	ug/L	0.079	87	4	26	74	KED
	Cd	**114**	**0.062**	ug/L	0.054	86	4	46	78	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB4
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:47:16
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	24521	1	Standard
	Kr	**83**		ug/L			38	57	13	Standard
>	**In-1**	**115**		ug/L			8744	8935	2	KED
	Cd	**111**	**0.016**	ug/L	0.005	30	4	8	13	KED
	Cd	**114**	**-0.000**	ug/L	0.004	1276	4	4	48	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0286-02RE1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:50:43
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	34600	1	Standard
	Kr	**83**		ug/L			38	62	7	Standard
>	**In-1**	**115**		ug/L			8744	7929	1	KED
	Cd	**111**	**0.061**	ug/L	0.023	37	4	17	30	KED
	Cd	**114**	**0.060**	ug/L	0.005	8	4	39	6	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0243-DUP1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:54:09
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	36241	1	Standard
	Kr	**83**		ug/L			38	64	32	Standard
>	**In-1**	**115**		ug/L			8744	7928	2	KED
	Cd	**111**	**0.088**	ug/L	0.009	10	4	23	8	KED
	Cd	**114**	**0.044**	ug/L	0.007	16	4	30	15	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0243-MS1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 18:57:36
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	36704	5	Standard
	Kr	**83**		ug/L			38	75	20	Standard
>	**In-1**	**115**		ug/L			8744	8236	1	KED
	Cd	**111**	**23.550**	ug/L	0.878	3	4	5501	2	KED
	Cd	**114**	**23.265**	ug/L	0.237	1	4	14201	1	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL6
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:02:04
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	28218	5	Standard
	Kr	**83**		ug/L			38	67	6	Standard
>	**In-1**	**115**		ug/L			8744	8810	2	KED
	Cd	**111**	**0.016**	ug/L	0.005	27	4	8	13	KED
	Cd	**114**	**0.003**	ug/L	0.004	143	4	6	40	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0364-59
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:05:31
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	38579	3	Standard
	Kr	**83**		ug/L			38	44	27	Standard
>	**In-1**	**115**		ug/L			8744	8024	2	KED
	Cd	**111**	**0.461**	ug/L	0.059	12	4	108	14	KED
	Cd	**114**	**0.441**	ug/L	0.035	7	4	266	6	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL7
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:08:59
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	27578	2	Standard
	Kr	**83**		ug/L			38	37	19	Standard
>	**In-1**	**115**		ug/L			8744	8590	1	KED
	Cd	**111**	**0.016**	ug/L	0.006	39	4	7	18	KED
	Cd	**114**	**0.001**	ug/L	0.008	622	4	5	88	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:12:26
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	25312	1	Standard
	Kr	**83**		ug/L			38	49	10	Standard
>	**In-1**	**115**		ug/L			8744	8883	2	KED
	Cd	**111**	**49.803**	ug/L	1.094	2	4	12542	1	KED
	Cd	**114**	**49.692**	ug/L	1.423	2	4	32698	1	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:18:37
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_dailymethod_ked_uct_cd only.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			27683	24969	4	Standard
	Kr	**83**		ug/L			38	40	10	Standard
>	**In-1**	**115**		ug/L			8744	9211	1	KED
	Cd	**111**	**0.011**	ug/L	0.012	105	4	7	41	KED
	Cd	**114**	**0.002**	ug/L	0.006	260	4	6	58	KED

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:22:45
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L				26580	0	Standard
>	**Sc**	**45**		ug/L				555694	4	Standard
	Cr	**52**		ug/L				17664	0	Standard
	Cr	**53**		ug/L				110	6	Standard
>	**Ge**	**72**		ug/L				43160	1	KED
	Ni	**60**		ug/L				16	35	KED
	Ni	**62**		ug/L				2	43	KED
	Cu	**63**		ug/L				55	12	KED
	Cu	**65**		ug/L				22	19	KED
	Zn	**66**		ug/L				82	11	KED
	Zn	**67**		ug/L				13	37	KED
	As	**75**		ug/L				4	40	KED
	Kr	**83**		ug/L				36	13	Standard
>	**In-1**	**115**		ug/L				9347	1	KED
	Cd	**111**		ug/L				5	47	KED
	Cd	**114**		ug/L				3	35	KED
>	**Tb**	**159**		ug/L				109925	2	Standard
	Pb	**208**		ug/L				113	17	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV6
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:27:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File:

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	28948	1	Standard
>	**Sc**	**45**		ug/L			555694	556456	2	Standard
	Cr	**52**	**48.230**	ug/L	0.671	1	17664	946322	3	Standard
	Cr	**53**	**47.698**	ug/L	0.594	1	110	109481	3	Standard
>	**Ge**	**72**		ug/L			43160	42898	1	KED
	Ni	**60**	**48.161**	ug/L	1.768	3	16	75299	3	KED
	Ni	**62**	**47.697**	ug/L	1.564	3	2	11883	2	KED
	Cu	**63**	**48.300**	ug/L	0.836	1	55	216376	3	KED
	Cu	**65**	**48.577**	ug/L	0.438	0	22	111017	0	KED
	Zn	**66**	**49.565**	ug/L	1.209	2	82	28351	1	KED
	Zn	**67**	**48.086**	ug/L	0.997	2	13	4767	3	KED
	As	**75**	**49.296**	ug/L	0.903	1	4	15395	0	KED
	Kr	**83**		ug/L			36	54	16	Standard
>	**In-1**	**115**		ug/L			9347	9014	0	KED
	Cd	**111**	**49.327**	ug/L	0.488	0	5	12608	0	KED
	Cd	**114**	**50.014**	ug/L	0.403	0	3	33406	1	KED
>	**Tb**	**159**		ug/L			109925	107398	2	Standard
	Pb	**208**	**51.592**	ug/L	1.272	2	113	1981245	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB6
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 19:34:08
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25882	3	Standard
⌈>	**Sc**	**45**		ug/L			555694	544722	0	Standard
|	**Cr**	**52**	**0.014**	ug/L	0.017	125	17664	17575	1	Standard
⌊	**Cr**	**53**	**0.001**	ug/L	0.004	503	110	110	8	Standard
⌈>	**Ge**	**72**		ug/L			43160	42759	1	KED
|	**Ni**	**60**	**0.014**	ug/L	0.017	120	16	38	69	KED
|	**Ni**	**62**	**0.025**	ug/L	0.035	137	2	8	98	KED
|	**Cu**	**63**	**0.021**	ug/L	0.026	119	55	151	77	KED
|	**Cu**	**65**	**0.026**	ug/L	0.027	105	22	81	77	KED
|	**Zn**	**66**	**0.029**	ug/L	0.046	157	82	98	27	KED
|	**Zn**	**67**	**0.079**	ug/L	0.072	90	13	20	32	KED
⌊	**As**	**75**	**0.016**	ug/L	0.024	151	4	9	81	KED
	Kr	**83**		ug/L			36	36	13	Standard
⌈>	**In-1**	**115**		ug/L			9347	9775	0	KED
|	**Cd**	**111**	**0.014**	ug/L	0.007	51	5	9	21	KED
⌊	**Cd**	**114**	**0.002**	ug/L	0.003	124	3	4	42	KED
⌈>	**Tb**	**159**		ug/L			109925	107802	1	Standard
⌊	**Pb**	**208**	**0.002**	ug/L	0.001	28	113	187	10	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-BLK1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 19:38:28
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	37951	2	Standard
⌈>	**Sc**	**45**		ug/L			555694	553325	3	Standard
|	**Cr**	**52**	**0.047**	ug/L	0.024	50	17664	18470	1	Standard
⌊	**Cr**	**53**	**0.007**	ug/L	0.004	61	110	126	11	Standard
⌈>	**Ge**	**72**		ug/L			43160	44237	1	KED
|	**Ni**	**60**	**-0.000**	ug/L	0.002	964	16	16	24	KED
|	**Ni**	**62**	**0.012**	ug/L	0.008	62	2	5	33	KED
|	**Cu**	**63**	**0.013**	ug/L	0.003	25	55	115	14	KED
|	**Cu**	**65**	**0.021**	ug/L	0.008	35	22	73	24	KED
|	**Zn**	**66**	**0.635**	ug/L	0.063	9	82	457	7	KED
|	**Zn**	**67**	**0.589**	ug/L	0.173	29	13	73	23	KED
⌊	**As**	**75**	**-0.000**	ug/L	0.004	1236	4	4	26	KED
	Kr	**83**		ug/L			36	41	11	Standard
⌈>	**In-1**	**115**		ug/L			9347	9656	1	KED
|	**Cd**	**111**	**0.009**	ug/L	0.010	109	5	7	33	KED
⌊	**Cd**	**114**	**-0.000**	ug/L	0.006	2733	3	2	132	KED
⌈>	**Tb**	**159**		ug/L			109925	110406	0	Standard
⌊	**Pb**	**208**	**0.010**	ug/L	0.002	15	113	502	11	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-BS1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 19:42:47
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	34859	3	Standard
>	Sc	45		ug/L			555694	537055	8	Standard
	Cr	52	26.827	ug/L	2.182	8	17664	513264	0	Standard
	Cr	53	25.995	ug/L	1.738	6	110	57419	1	Standard
>	Ge	72		ug/L			43160	43070	3	KED
	Ni	60	25.525	ug/L	0.669	2	16	40054	0	KED
	Ni	62	26.404	ug/L	1.118	4	2	6604	3	KED
	Cu	63	26.094	ug/L	0.553	2	55	117346	2	KED
	Cu	65	26.641	ug/L	0.983	3	22	61110	2	KED
	Zn	66	81.011	ug/L	2.312	2	82	46458	1	KED
	Zn	67	72.478	ug/L	1.846	2	13	7204	2	KED
	As	75	24.784	ug/L	0.516	2	4	7771	1	KED
	Kr	83		ug/L			36	49	21	Standard
>	In-1	115		ug/L			9347	9331	1	KED
	Cd	111	25.449	ug/L	0.729	2	5	6735	2	KED
	Cd	114	25.148	ug/L	1.178	4	3	17389	4	KED
>	Tb	159		ug/L			109925	106286	6	Standard
	Pb	208	27.843	ug/L	1.648	5	113	1055940	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-SRL1
Sample Dil Factor: 100
Comments:
Sample Date/Time: Friday, July 14, 2023 19:47:05

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	31615	1	Standard
>	**Sc**	**45**		ug/L			555694	610478	1	Standard
	Cr	**52**	**5.306**	ug/L	0.100	1	17664	131431	0	Standard
	Cr	**53**	**5.269**	ug/L	0.207	3	110	13367	1	Standard
>	**Ge**	**72**		ug/L			43160	44059	1	KED
	Ni	**60**	**3.755**	ug/L	0.103	2	16	6043	1	KED
	Ni	**62**	**3.842**	ug/L	0.286	7	2	985	6	KED
	Cu	**63**	**13.803**	ug/L	0.390	2	55	63533	2	KED
	Cu	**65**	**13.730**	ug/L	0.311	2	22	32242	1	KED
	Zn	**66**	**35.089**	ug/L	0.624	1	82	20641	0	KED
	Zn	**67**	**33.660**	ug/L	0.719	2	13	3430	1	KED
	As	**75**	**0.728**	ug/L	0.031	4	4	237	3	KED
	Kr	**83**		ug/L			36	59	19	Standard
>	**In-1**	**115**		ug/L			9347	9202	2	KED
	Cd	**111**	**0.071**	ug/L	0.013	18	5	23	14	KED
	Cd	**114**	**0.087**	ug/L	0.021	24	3	61	21	KED
>	**Tb**	**159**		ug/L			109925	115706	2	Standard
	Pb	**208**	**9.346**	ug/L	0.189	2	113	386810	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-01
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 19:51:24

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	41985	2	Standard
>	**Sc**	**45**		ug/L			555694	772240	3	Standard
	Cr	**52**	**19.051**	ug/L	0.688	3	17664	533095	0	Standard
	Cr	**53**	**18.872**	ug/L	0.329	1	110	60182	1	Standard
>	**Ge**	**72**		ug/L			43160	44221	1	KED
	Ni	**60**	**18.014**	ug/L	0.443	2	16	29039	1	KED
	Ni	**62**	**18.376**	ug/L	0.670	3	2	4721	2	KED
	Cu	**63**	**63.996**	ug/L	1.011	1	55	295436	0	KED
	Cu	**65**	**65.855**	ug/L	2.767	4	22	155099	2	KED
	Zn	**66**	**152.669**	ug/L	5.312	3	82	89841	2	KED
	Zn	**67**	**144.917**	ug/L	2.986	2	13	14779	1	KED
	As	**75**	**3.402**	ug/L	0.103	3	4	1099	2	KED
	Kr	**83**		ug/L			36	116	5	Standard
>	**In-1**	**115**		ug/L			9347	9571	0	KED
	Cd	**111**	**0.318**	ug/L	0.059	18	5	91	18	KED
	Cd	**114**	**0.338**	ug/L	0.055	16	3	242	15	KED
>	**Tb**	**159**		ug/L			109925	131206	2	Standard
	Pb	**208**	**39.942**	ug/L	1.420	3	113	1873667	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-DUP1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 19:55:43

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	40834	2	Standard
>	**Sc**	**45**		ug/L			555694	769374	2	Standard
	Cr	**52**	**18.979**	ug/L	0.652	3	17664	529348	1	Standard
	Cr	**53**	**18.782**	ug/L	0.502	2	110	59674	1	Standard
>	**Ge**	**72**		ug/L			43160	43930	1	KED
	Ni	**60**	**17.901**	ug/L	0.693	3	16	28674	4	KED
	Ni	**62**	**18.197**	ug/L	0.494	2	2	4644	1	KED
	Cu	**63**	**64.079**	ug/L	1.313	2	55	293888	1	KED
	Cu	**65**	**64.293**	ug/L	1.453	2	22	150454	1	KED
	Zn	**66**	**151.102**	ug/L	3.537	2	82	88358	2	KED
	Zn	**67**	**143.613**	ug/L	3.810	2	13	14550	2	KED
	As	**75**	**3.418**	ug/L	0.129	3	4	1097	4	KED
	Kr	**83**		ug/L			36	131	18	Standard
>	**In-1**	**115**		ug/L			9347	9356	2	KED
	Cd	**111**	**0.283**	ug/L	0.026	9	5	80	7	KED
	Cd	**114**	**0.314**	ug/L	0.039	12	3	221	13	KED
>	**Tb**	**159**		ug/L			109925	128986	1	Standard
	Pb	**208**	**35.897**	ug/L	0.320	0	113	1656237	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-MS1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:00:02

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	31380	1	Standard
>	**Sc**	**45**		ug/L			555694	547740	2	Standard
	Cr	**52**	**-0.009**	ug/L	0.041	447	17664	17230	3	Standard
	Cr	**53**	**0.003**	ug/L	0.005	164	110	115	10	Standard
>	**Ge**	**72**		ug/L			43160	41568	2	KED
	Ni	**60**	**0.004**	ug/L	0.003	85	16	21	20	KED
	Ni	**62**	**0.003**	ug/L	0.005	152	2	3	34	KED
	Cu	**63**	**0.021**	ug/L	0.004	18	55	146	13	KED
	Cu	**65**	**0.033**	ug/L	0.010	30	22	94	25	KED
	Zn	**66**	**0.547**	ug/L	0.037	6	82	381	5	KED
	Zn	**67**	**0.574**	ug/L	0.085	14	13	67	13	KED
	As	**75**	**-0.001**	ug/L	0.007	1332	4	4	54	KED
	Kr	**83**		ug/L			36	36	9	Standard
>	**In-1**	**115**		ug/L			9347	9085	2	KED
	Cd	**111**	**0.003**	ug/L	0.007	237	5	5	33	KED
	Cd	**114**	**0.005**	ug/L	0.004	89	3	6	48	KED
>	**Tb**	**159**		ug/L			109925	108290	2	Standard
	Pb	**208**	**0.007**	ug/L	0.000	2	113	382	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-MSD1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:04:21

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	47958	1	Standard
>	**Sc**	**45**		ug/L			555694	975502	2	Standard
	Cr	**52**	**55.515**	ug/L	3.581	6	17664	1902260	3	Standard
	Cr	**53**	**56.357**	ug/L	1.678	2	110	226583	0	Standard
>	**Ge**	**72**		ug/L			43160	42445	1	KED
	Ni	**60**	**83.037**	ug/L	1.678	2	16	128446	2	KED
	Ni	**62**	**83.055**	ug/L	0.822	0	2	20476	0	KED
	Cu	**63**	**169.680**	ug/L	5.055	2	55	751726	1	KED
	Cu	**65**	**171.013**	ug/L	4.746	2	22	386672	2	KED
	Zn	**66**	**417.035**	ug/L	3.996	0	82	235473	0	KED
	Zn	**67**	**394.068**	ug/L	10.310	2	13	38551	1	KED
	As	**75**	**48.311**	ug/L	0.661	1	4	14929	0	KED
	Kr	**83**		ug/L			36	255	5	Standard
>	**In-1**	**115**		ug/L			9347	9162	2	KED
	Cd	**111**	**46.808**	ug/L	1.025	2	5	12158	0	KED
	Cd	**114**	**46.025**	ug/L	0.747	1	3	31241	1	KED
>	**Tb**	**159**		ug/L			109925	143760	0	Standard
	Pb	**208**	**95.485**	ug/L	0.533	0	113	4910186	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-PS1
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:08:40

DEL

Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	44333	3	Standard
>	**Sc**	**45**		ug/L			555694	774117	1	Standard
	Cr	**52**	**38.950**	ug/L	0.365	0	17664	1067699	1	Standard
	Cr	**53**	**38.566**	ug/L	0.897	2	110	123175	3	Standard
>	**Ge**	**72**		ug/L			43160	43156	0	KED
	Ni	**60**	**44.974**	ug/L	0.432	0	16	70740	1	KED
	Ni	**62**	**46.052**	ug/L	0.434	0	2	11544	0	KED
	Cu	**63**	**91.735**	ug/L	2.220	2	55	413345	2	KED
	Cu	**65**	**94.284**	ug/L	0.999	1	22	216776	1	KED
	Zn	**66**	**237.065**	ug/L	1.768	0	82	136135	0	KED
	Zn	**67**	**225.915**	ug/L	2.742	1	13	22480	1	KED
	As	**75**	**29.888**	ug/L	0.336	1	4	9394	1	KED
	Kr	**83**		ug/L			36	117	19	Standard
>	**In-1**	**115**		ug/L			9347	9091	0	KED
	Cd	**111**	**28.116**	ug/L	0.714	2	5	7250	2	KED
	Cd	**114**	**27.465**	ug/L	0.613	2	3	18503	2	KED
>	**Tb**	**159**		ug/L			109925	128538	1	Standard
	Pb	**208**	**64.203**	ug/L	1.646	2	113	2951031	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0203-SRM1
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 20:12:53
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	31277	3	Standard
>	Sc	45		ug/L			555694	580476	1	Standard
	Cr	52	47.317	ug/L	0.856	1	17664	968420	0	Standard
	Cr	53	47.079	ug/L	1.323	2	110	112683	1	Standard
>	Ge	72		ug/L			43160	44361	0	KED
	Ni	60	100.820	ug/L	2.917	2	16	162960	2	KED
	Ni	62	102.767	ug/L	1.041	1	2	26478	0	KED
	Cu	63	45.890	ug/L	0.782	1	55	212563	1	KED
	Cu	65	46.782	ug/L	1.785	3	22	110545	2	KED
	Zn	66	62.113	ug/L	1.570	2	82	36725	2	KED
	Zn	67	68.125	ug/L	0.618	0	13	6977	0	KED
	As	75	28.714	ug/L	0.684	2	4	9275	1	KED
	Kr	83		ug/L			36	71	10	Standard
>	In-1	115		ug/L			9347	9228	2	KED
	Cd	111	31.926	ug/L	1.526	4	5	8349	1	KED
	Cd	114	31.726	ug/L	1.330	4	3	21679	1	KED
>	Tb	159		ug/L			109925	135082	1	Standard
	Pb	208	75.294	ug/L	1.690	2	113	3637131	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL8
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 20:17:12
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	29966	0	Standard
>	**Sc**	**45**		ug/L			555694	550880	1	Standard
	Cr	**52**	**-0.025**	ug/L	0.039	156	17664	17030	2	Standard
	Cr	**53**	**-0.003**	ug/L	0.004	127	110	103	8	Standard
>	**Ge**	**72**		ug/L			43160	38913	13	KED
	Ni	**60**	**0.009**	ug/L	0.002	26	16	27	4	KED
	Ni	**62**	**0.004**	ug/L	0.006	141	2	3	34	KED
	Cu	**63**	**0.006**	ug/L	0.001	17	55	72	10	KED
	Cu	**65**	**0.012**	ug/L	0.007	57	22	45	39	KED
	Zn	**66**	**-0.001**	ug/L	0.050	3813	82	71	24	KED
	Zn	**67**	**0.040**	ug/L	0.075	187	13	15	49	KED
	As	**75**	**0.010**	ug/L	0.009	89	4	6	21	KED
	Kr	**83**		ug/L			36	52	28	Standard
>	**In-1**	**115**		ug/L			9347	9214	1	KED
	Cd	**111**	**0.006**	ug/L	0.013	207	5	6	51	KED
	Cd	**114**	**0.007**	ug/L	0.004	57	3	8	35	KED
>	**Tb**	**159**		ug/L			109925	108143	1	Standard
	Pb	**208**	**0.013**	ug/L	0.001	7	113	621	5	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV7
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 20:21:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	26712	6	Standard
>	**Sc**	**45**		ug/L			555694	554644	2	Standard
	Cr	**52**	**50.417**	ug/L	1.866	3	17664	984380	1	Standard
	Cr	**53**	**47.433**	ug/L	1.991	4	110	108435	2	Standard
>	**Ge**	**72**		ug/L			43160	42484	2	KED
	Ni	**60**	**48.056**	ug/L	0.327	0	16	74411	2	KED
	Ni	**62**	**47.608**	ug/L	0.762	1	2	11748	1	KED
	Cu	**63**	**47.702**	ug/L	0.235	0	55	211593	1	KED
	Cu	**65**	**49.486**	ug/L	0.777	1	22	111998	1	KED
	Zn	**66**	**49.062**	ug/L	0.176	0	82	27801	2	KED
	Zn	**67**	**48.111**	ug/L	1.326	2	13	4724	4	KED
	As	**75**	**48.922**	ug/L	0.630	1	4	15132	1	KED
	Kr	**83**		ug/L			36	37	34	Standard
>	**In-1**	**115**		ug/L			9347	9420	2	KED
	Cd	**111**	**49.396**	ug/L	1.252	2	5	13189	0	KED
	Cd	**114**	**49.968**	ug/L	1.033	2	3	34866	0	KED
>	**Tb**	**159**		ug/L			109925	108326	1	Standard
	Pb	**208**	**50.892**	ug/L	0.945	1	113	1971680	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB7
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 20:28:35
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25809	3	Standard
>	**Sc**	**45**		ug/L			555694	543695	1	Standard
	Cr	**52**	**-0.021**	ug/L	0.014	69	17664	16892	1	Standard
	Cr	**53**	**-0.000**	ug/L	0.006	4116	110	107	10	Standard
>	**Ge**	**72**		ug/L			43160	43046	1	KED
	Ni	**60**	**0.006**	ug/L	0.004	65	16	26	23	KED
	Ni	**62**	**0.005**	ug/L	0.008	152	2	3	50	KED
	Cu	**63**	**0.005**	ug/L	0.002	38	55	77	10	KED
	Cu	**65**	**0.006**	ug/L	0.003	59	22	34	22	KED
	Zn	**66**	**0.031**	ug/L	0.016	50	82	100	10	KED
	Zn	**67**	**0.053**	ug/L	0.081	154	13	18	41	KED
	As	**75**	**0.005**	ug/L	0.004	68	4	6	16	KED
	Kr	**83**		ug/L			36	53	19	Standard
>	**In-1**	**115**		ug/L			9347	9413	0	KED
	Cd	**111**	**0.008**	ug/L	0.004	52	5	7	15	KED
	Cd	**114**	**0.003**	ug/L	0.003	80	3	5	35	KED
>	**Tb**	**159**		ug/L			109925	104424	1	Standard
	Pb	**208**	**0.003**	ug/L	0.000	10	113	213	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-02
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:32:55
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	38461	6	Standard
>	Sc	45		ug/L			555694	733345	1	Standard
	Cr	52	14.223	ug/L	0.087	0	17664	384139	1	Standard
	Cr	53	14.038	ug/L	0.272	1	110	42560	1	Standard
>	Ge	72		ug/L			43160	43358	1	KED
	Ni	60	16.839	ug/L	0.431	2	16	26616	1	KED
	Ni	62	16.824	ug/L	0.259	1	2	4238	0	KED
	Cu	63	32.865	ug/L	0.596	1	55	148795	1	KED
	Cu	65	33.501	ug/L	0.315	0	22	77394	1	KED
	Zn	66	79.537	ug/L	0.853	1	82	45944	1	KED
	Zn	67	80.180	ug/L	1.138	1	13	8023	0	KED
	As	75	2.641	ug/L	0.020	0	4	838	1	KED
	Kr	83		ug/L			36	104	18	Standard
>	In-1	115		ug/L			9347	9513	0	KED
	Cd	111	0.157	ug/L	0.016	10	5	47	9	KED
	Cd	114	0.148	ug/L	0.020	13	3	107	12	KED
>	Tb	159		ug/L			109925	126072	1	Standard
	Pb	208	17.839	ug/L	0.503	2	113	804359	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-03
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:37:14
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	42310	3	Standard
>	Sc	45		ug/L			555694	733366	2	Standard
	Cr	52	13.302	ug/L	0.464	3	17664	360637	1	Standard
	Cr	53	13.330	ug/L	0.642	4	110	40400	2	Standard
>	Ge	72		ug/L			43160	43650	0	KED
	Ni	60	13.596	ug/L	0.032	0	16	21641	0	KED
	Ni	62	14.179	ug/L	0.780	5	2	3596	4	KED
	Cu	63	23.998	ug/L	0.359	1	55	109398	1	KED
	Cu	65	24.644	ug/L	0.818	3	22	57317	2	KED
	Zn	66	102.468	ug/L	2.571	2	82	59556	1	KED
	Zn	67	96.976	ug/L	2.590	2	13	9766	1	KED
	As	75	2.802	ug/L	0.055	1	4	894	1	KED
	Kr	83		ug/L			36	115	13	Standard
>	In-1	115		ug/L			9347	9451	2	KED
	Cd	111	0.186	ug/L	0.028	15	5	55	16	KED
	Cd	114	0.177	ug/L	0.028	15	3	126	12	KED
>	Tb	159		ug/L			109925	125940	1	Standard
	Pb	208	17.122	ug/L	0.454	2	113	771217	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-04
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:41:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	45158	4	Standard
>	Sc	45		ug/L			555694	764451	3	Standard
	Cr	52	39.120	ug/L	1.414	3	17664	1057985	0	Standard
	Cr	53	39.053	ug/L	1.527	3	110	123075	2	Standard
>	Ge	72		ug/L			43160	43409	0	KED
	Ni	60	17.414	ug/L	0.348	1	16	27563	2	KED
	Ni	62	19.654	ug/L	0.530	2	2	4957	2	KED
	Cu	63	1015.713	ug/L	11.292	1	55	4602483	0	KED
	Cu	65	1023.175	ug/L	15.916	1	22	2365868	1	KED
	Zn	66	462.396	ug/L	6.308	1	82	267037	2	KED
	Zn	67	417.850	ug/L	4.849	1	13	41811	1	KED
	As	75	40.113	ug/L	0.489	1	4	12679	0	KED
	Kr	83		ug/L			36	125	13	Standard
>	In-1	115		ug/L			9347	9344	1	KED
	Cd	111	0.655	ug/L	0.026	3	5	178	4	KED
	Cd	114	0.637	ug/L	0.028	4	3	443	3	KED
>	Tb	159		ug/L			109925	128193	1	Standard
	Pb	208	306.897	ug/L	7.251	2	113	14068467	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-05
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:45:51
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	42822	5	Standard
>	Sc	45		ug/L			555694	762248	1	Standard
	Cr	52	18.793	ug/L	0.332	1	17664	519821	2	Standard
	Cr	53	18.429	ug/L	0.317	1	110	58035	2	Standard
>	Ge	72		ug/L			43160	42728	2	KED
	Ni	60	18.787	ug/L	0.215	1	16	29264	1	KED
	Ni	62	19.921	ug/L	0.678	3	2	4944	1	KED
	Cu	63	180.482	ug/L	1.961	1	55	804993	1	KED
	Cu	65	180.720	ug/L	0.957	0	22	411329	1	KED
	Zn	66	116.119	ug/L	0.790	0	82	66057	1	KED
	Zn	67	111.587	ug/L	4.392	3	13	10995	2	KED
	As	75	12.416	ug/L	0.189	1	4	3865	1	KED
	Kr	83		ug/L			36	119	6	Standard
>	In-1	115		ug/L			9347	9252	2	KED
	Cd	111	0.233	ug/L	0.048	20	5	66	16	KED
	Cd	114	0.238	ug/L	0.049	20	3	166	18	KED
>	Tb	159		ug/L			109925	129694	0	Standard
	Pb	208	34.438	ug/L	0.136	0	113	1597685	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-06
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:50:10
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	36798	1	Standard
>	Sc	45		ug/L			555694	679944	1	Standard
	Cr	52	21.990	ug/L	0.595	2	17664	538740	1	Standard
	Cr	53	21.675	ug/L	0.281	1	110	60852	0	Standard
>	Ge	72		ug/L			43160	43302	1	KED
	Ni	60	27.469	ug/L	0.999	3	16	43338	1	KED
	Ni	62	28.125	ug/L	1.299	4	2	7071	2	KED
	Cu	63	49.372	ug/L	0.362	0	55	223237	2	KED
	Cu	65	50.205	ug/L	0.695	1	22	115805	0	KED
	Zn	66	124.650	ug/L	3.201	2	82	71839	0	KED
	Zn	67	119.853	ug/L	3.392	2	13	11968	1	KED
	As	75	4.689	ug/L	0.101	2	4	1482	0	KED
	Kr	83		ug/L			36	93	3	Standard
>	In-1	115		ug/L			9347	9497	1	KED
	Cd	111	0.182	ug/L	0.055	30	5	53	25	KED
	Cd	114	0.191	ug/L	0.005	2	3	137	4	KED
>	Tb	159		ug/L			109925	122627	2	Standard
	Pb	208	57.208	ug/L	0.369	0	113	2509225	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-07
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:54:29
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	34075	3	Standard
>	Sc	45		ug/L			555694	720773	1	Standard
	Cr	52	12.636	ug/L	0.457	3	17664	337892	2	Standard
	Cr	53	12.455	ug/L	0.440	3	110	37124	2	Standard
>	Ge	72		ug/L			43160	43326	1	KED
	Ni	60	18.561	ug/L	0.434	2	16	29311	1	KED
	Ni	62	18.429	ug/L	0.148	0	2	4639	1	KED
	Cu	63	17.347	ug/L	0.521	3	55	78483	1	KED
	Cu	65	17.460	ug/L	0.655	3	22	40299	1	KED
	Zn	66	41.899	ug/L	0.683	1	82	24221	1	KED
	Zn	67	45.944	ug/L	1.264	2	13	4599	2	KED
	As	75	2.122	ug/L	0.036	1	4	673	0	KED
	Kr	83		ug/L			36	123	13	Standard
>	In-1	115		ug/L			9347	9247	2	KED
	Cd	111	0.074	ug/L	0.037	49	5	24	39	KED
	Cd	114	0.072	ug/L	0.016	22	3	51	18	KED
>	Tb	159		ug/L			109925	131533	2	Standard
	Pb	208	2.596	ug/L	0.078	3	113	122229	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-08
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 20:58:48
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	41375	4	Standard
>	Sc	45		ug/L			555694	754617	1	Standard
	Cr	52	14.806	ug/L	0.321	2	17664	410396	0	Standard
	Cr	53	14.587	ug/L	0.173	1	110	45511	2	Standard
>	Ge	72		ug/L			43160	43352	1	KED
	Ni	60	19.861	ug/L	0.677	3	16	31381	2	KED
	Ni	62	20.677	ug/L	1.033	4	2	5205	3	KED
	Cu	63	21.279	ug/L	0.331	1	55	96335	1	KED
	Cu	65	21.464	ug/L	0.649	3	22	49574	2	KED
	Zn	66	42.029	ug/L	2.214	5	82	24296	3	KED
	Zn	67	47.376	ug/L	2.097	4	13	4743	2	KED
	As	75	2.666	ug/L	0.073	2	4	845	1	KED
	Kr	83		ug/L			36	130	0	Standard
>	In-1	115		ug/L			9347	9275	2	KED
	Cd	111	0.075	ug/L	0.014	18	5	24	13	KED
	Cd	114	0.069	ug/L	0.014	20	3	50	18	KED
>	Tb	159		ug/L			109925	127645	0	Standard
	Pb	208	3.083	ug/L	0.061	1	113	140883	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-09
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:03:07
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	41786	2	Standard
>	Sc	45		ug/L			555694	750431	2	Standard
	Cr	52	16.615	ug/L	0.461	2	17664	455002	0	Standard
	Cr	53	16.698	ug/L	0.041	0	110	51778	2	Standard
>	Ge	72		ug/L			43160	42823	3	KED
	Ni	60	21.555	ug/L	0.586	2	16	33633	0	KED
	Ni	62	22.592	ug/L	0.886	3	2	5616	0	KED
	Cu	63	48.836	ug/L	1.719	3	55	218208	0	KED
	Cu	65	49.885	ug/L	2.401	4	22	113711	2	KED
	Zn	66	106.155	ug/L	3.516	3	82	60495	0	KED
	Zn	67	103.599	ug/L	0.988	0	13	10234	2	KED
	As	75	6.393	ug/L	0.335	5	4	1995	2	KED
	Kr	83		ug/L			36	124	4	Standard
>	In-1	115		ug/L			9347	9267	2	KED
	Cd	111	0.154	ug/L	0.004	2	5	45	5	KED
	Cd	114	0.166	ug/L	0.025	14	3	116	12	KED
>	Tb	159		ug/L			109925	129777	1	Standard
	Pb	208	20.726	ug/L	0.314	1	113	962131	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-10
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:07:26
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	36405	2	Standard
>	Sc	45		ug/L			555694	712121	2	Standard
	Cr	52	15.489	ug/L	0.239	1	17664	404190	2	Standard
	Cr	53	15.110	ug/L	0.178	1	110	44468	1	Standard
>	Ge	72		ug/L			43160	42980	0	KED
	Ni	60	21.483	ug/L	0.097	0	16	33662	0	KED
	Ni	62	21.415	ug/L	0.663	3	2	5348	2	KED
	Cu	63	18.535	ug/L	0.567	3	55	83211	2	KED
	Cu	65	18.334	ug/L	0.260	1	22	41998	1	KED
	Zn	66	47.834	ug/L	0.049	0	82	27423	0	KED
	Zn	67	49.754	ug/L	0.491	0	13	4941	1	KED
	As	75	2.171	ug/L	0.108	4	4	683	4	KED
	Kr	83		ug/L			36	95	11	Standard
>	In-1	115		ug/L			9347	9358	2	KED
	Cd	111	0.068	ug/L	0.010	14	5	23	13	KED
	Cd	114	0.050	ug/L	0.013	26	3	37	24	KED
>	Tb	159		ug/L			109925	125689	0	Standard
	Pb	208	3.722	ug/L	0.065	1	113	167436	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBL9
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 21:11:45
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	29576	4	Standard
>	**Sc**	**45**		ug/L			555694	548600	0	Standard
	Cr	**52**	**-0.049**	ug/L	0.019	38	17664	16502	1	Standard
	Cr	**53**	**0.001**	ug/L	0.004	298	110	111	7	Standard
>	**Ge**	**72**		ug/L			43160	42605	0	KED
	Ni	**60**	**0.035**	ug/L	0.059	170	16	69	130	KED
	Ni	**62**	**0.057**	ug/L	0.056	98	2	16	83	KED
	Cu	**63**	**0.066**	ug/L	0.098	149	55	345	125	KED
	Cu	**65**	**0.077**	ug/L	0.120	155	22	196	138	KED
	Zn	**66**	**0.112**	ug/L	0.199	177	82	144	77	KED
	Zn	**67**	**0.138**	ug/L	0.236	171	13	26	86	KED
	As	**75**	**0.009**	ug/L	0.018	199	4	7	76	KED
	Kr	**83**		ug/L			36	45	7	Standard
>	**In-1**	**115**		ug/L			9347	9264	3	KED
	Cd	**111**	**0.009**	ug/L	0.010	112	5	7	32	KED
	Cd	**114**	**0.007**	ug/L	0.003	42	3	7	26	KED
>	**Tb**	**159**		ug/L			109925	105613	1	Standard
	Pb	**208**	**0.006**	ug/L	0.001	11	113	325	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV8
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 21:16:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25944	5	Standard
>	**Sc**	**45**		ug/L			555694	536283	2	Standard
	Cr	**52**	**47.678**	ug/L	0.427	0	17664	901497	1	Standard
	Cr	**53**	**47.538**	ug/L	0.424	0	110	105137	1	Standard
>	**Ge**	**72**		ug/L			43160	42226	1	KED
	Ni	**60**	**46.898**	ug/L	0.514	1	16	72169	1	KED
	Ni	**62**	**47.698**	ug/L	1.319	2	2	11696	1	KED
	Cu	**63**	**48.129**	ug/L	0.660	1	55	212170	0	KED
	Cu	**65**	**48.003**	ug/L	0.538	1	22	107991	1	KED
	Zn	**66**	**48.152**	ug/L	0.674	1	82	27115	0	KED
	Zn	**67**	**47.971**	ug/L	0.723	1	13	4680	0	KED
	As	**75**	**48.655**	ug/L	0.413	0	4	14958	1	KED
	Kr	**83**		ug/L			36	50	20	Standard
>	**In-1**	**115**		ug/L			9347	9086	1	KED
	Cd	**111**	**49.394**	ug/L	0.992	2	5	12725	0	KED
	Cd	**114**	**49.599**	ug/L	1.022	2	3	33389	0	KED
>	**Tb**	**159**		ug/L			109925	105396	4	Standard
	Pb	**208**	**50.638**	ug/L	1.906	3	113	1907224	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB8
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 21:23:08
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	26311	2	Standard
>	**Sc**	**45**		ug/L			555694	540316	1	Standard
	Cr	**52**	**-0.038**	ug/L	0.065	171	17664	16464	6	Standard
	Cr	**53**	**-0.005**	ug/L	0.008	157	110	96	18	Standard
>	**Ge**	**72**		ug/L			43160	42531	1	KED
	Ni	**60**	**0.039**	ug/L	0.065	165	16	75	129	KED
	Ni	**62**	**0.055**	ug/L	0.073	133	2	15	110	KED
	Cu	**63**	**0.062**	ug/L	0.099	160	55	323	132	KED
	Cu	**65**	**0.064**	ug/L	0.094	146	22	164	126	KED
	Zn	**66**	**0.059**	ug/L	0.095	160	82	114	44	KED
	Zn	**67**	**0.094**	ug/L	0.136	143	13	22	58	KED
	As	**75**	**0.039**	ug/L	0.058	148	4	16	107	KED
	Kr	**83**		ug/L			36	42	15	Standard
>	**In-1**	**115**		ug/L			9347	9381	2	KED
	Cd	**111**	**0.006**	ug/L	0.009	160	5	6	37	KED
	Cd	**114**	**0.004**	ug/L	0.003	67	3	6	34	KED
>	**Tb**	**159**		ug/L			109925	106280	2	Standard
	Pb	**208**	**0.003**	ug/L	0.001	27	113	214	13	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-11
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:27:28
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	41867	4	Standard
>	Sc	45		ug/L			555694	730443	0	Standard
	Cr	52	13.711	ug/L	0.336	2	17664	369626	1	Standard
	Cr	53	13.597	ug/L	0.210	1	110	41066	1	Standard
>	Ge	72		ug/L			43160	41768	1	KED
	Ni	60	13.753	ug/L	0.146	1	16	20946	0	KED
	Ni	62	13.670	ug/L	0.303	2	2	3319	3	KED
	Cu	63	34.035	ug/L	0.953	2	55	148419	1	KED
	Cu	65	34.066	ug/L	0.487	1	22	75809	0	KED
	Zn	66	90.988	ug/L	0.754	0	82	50616	0	KED
	Zn	67	89.265	ug/L	2.681	3	13	8603	2	KED
	As	75	3.002	ug/L	0.048	1	4	916	0	KED
	Kr	83		ug/L			36	109	7	Standard
>	In-1	115		ug/L			9347	9231	0	KED
	Cd	111	0.145	ug/L	0.025	17	5	42	15	KED
	Cd	114	0.140	ug/L	0.022	15	3	99	15	KED
>	Tb	159		ug/L			109925	124037	1	Standard
	Pb	208	10.521	ug/L	0.153	1	113	466864	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-12
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:31:47
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	41702	3	Standard
>	Sc	45		ug/L			555694	801636	3	Standard
	Cr	52	15.638	ug/L	0.802	5	17664	458644	1	Standard
	Cr	53	15.602	ug/L	0.811	5	110	51634	2	Standard
>	Ge	72		ug/L			43160	42785	1	KED
	Ni	60	17.776	ug/L	0.532	2	16	27724	1	KED
	Ni	62	18.576	ug/L	0.101	0	2	4618	0	KED
	Cu	63	29.826	ug/L	0.474	1	55	133254	1	KED
	Cu	65	29.768	ug/L	1.204	4	22	67849	3	KED
	Zn	66	120.177	ug/L	2.709	2	82	68449	1	KED
	Zn	67	120.082	ug/L	1.335	1	13	11851	0	KED
	As	75	2.967	ug/L	0.130	4	4	928	4	KED
	Kr	83		ug/L			36	150	11	Standard
>	In-1	115		ug/L			9347	9180	1	KED
	Cd	111	0.175	ug/L	0.006	3	5	50	1	KED
	Cd	114	0.203	ug/L	0.022	10	3	140	9	KED
>	Tb	159		ug/L			109925	130622	3	Standard
	Pb	208	16.468	ug/L	0.752	4	113	768751	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-13
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:36:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	42748	1	Standard
>	Sc	45		ug/L			555694	797512	1	Standard
	Cr	52	16.501	ug/L	0.168	1	17664	480615	1	Standard
	Cr	53	16.113	ug/L	0.205	1	110	53099	0	Standard
>	Ge	72		ug/L			43160	42698	0	KED
	Ni	60	18.014	ug/L	0.654	3	16	28047	4	KED
	Ni	62	18.839	ug/L	0.364	1	2	4674	1	KED
	Cu	63	32.087	ug/L	0.339	1	55	143074	1	KED
	Cu	65	32.274	ug/L	0.270	0	22	73430	1	KED
	Zn	66	138.412	ug/L	1.880	1	82	78671	0	KED
	Zn	67	136.151	ug/L	5.478	4	13	13407	3	KED
	As	75	3.382	ug/L	0.072	2	4	1055	1	KED
	Kr	83		ug/L			36	144	6	Standard
>	In-1	115		ug/L			9347	8753	2	KED
	Cd	111	0.232	ug/L	0.040	17	5	62	13	KED
	Cd	114	0.221	ug/L	0.047	21	3	145	20	KED
>	Tb	159		ug/L			109925	129983	1	Standard
	Pb	208	17.947	ug/L	0.461	2	113	834286	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-14
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:40:24
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	40680	2	Standard
>	Sc	45		ug/L			555694	730116	0	Standard
	Cr	52	14.273	ug/L	0.359	2	17664	383716	2	Standard
	Cr	53	14.103	ug/L	0.138	0	110	42573	1	Standard
>	Ge	72		ug/L			43160	41950	0	KED
	Ni	60	13.428	ug/L	0.203	1	16	20540	1	KED
	Ni	62	13.544	ug/L	0.254	1	2	3301	0	KED
	Cu	63	59.285	ug/L	1.179	1	55	259704	2	KED
	Cu	65	60.194	ug/L	1.696	2	22	134511	2	KED
	Zn	66	129.226	ug/L	3.053	2	82	72162	1	KED
	Zn	67	120.144	ug/L	2.088	1	13	11627	2	KED
	As	75	3.757	ug/L	0.116	3	4	1151	2	KED
	Kr	83		ug/L			36	93	24	Standard
>	In-1	115		ug/L			9347	9198	1	KED
	Cd	111	0.225	ug/L	0.039	17	5	63	16	KED
	Cd	114	0.206	ug/L	0.027	13	3	143	13	KED
>	Tb	159		ug/L			109925	123383	1	Standard
	Pb	208	18.399	ug/L	0.518	2	113	811889	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-15
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:44:43
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	38536	1	Standard
>	Sc	45		ug/L			555694	668298	3	Standard
	Cr	52	9.563	ug/L	0.307	3	17664	242163	0	Standard
	Cr	53	9.356	ug/L	0.325	3	110	25876	1	Standard
>	Ge	72		ug/L			43160	43581	0	KED
	Ni	60	12.667	ug/L	0.313	2	16	20130	1	KED
	Ni	62	13.071	ug/L	0.240	1	2	3310	1	KED
	Cu	63	16.534	ug/L	0.164	0	55	75279	1	KED
	Cu	65	16.545	ug/L	0.125	0	22	38431	0	KED
	Zn	66	68.243	ug/L	1.637	2	82	39633	2	KED
	Zn	67	68.018	ug/L	0.726	1	13	6844	0	KED
	As	75	3.331	ug/L	0.034	1	4	1061	1	KED
	Kr	83		ug/L			36	86	5	Standard
>	In-1	115		ug/L			9347	9032	4	KED
	Cd	111	0.081	ug/L	0.024	29	5	25	25	KED
	Cd	114	0.085	ug/L	0.008	9	3	59	11	KED
>	Tb	159		ug/L			109925	123227	1	Standard
	Pb	208	9.371	ug/L	0.187	1	113	413091	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-16
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:49:02
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	42703	1	Standard
>	Sc	45		ug/L			555694	724008	1	Standard
	Cr	52	13.002	ug/L	0.302	2	17664	348601	1	Standard
	Cr	53	13.024	ug/L	0.323	2	110	38985	1	Standard
>	Ge	72		ug/L			43160	45511	2	KED
	Ni	60	13.099	ug/L	0.613	4	16	21723	2	KED
	Ni	62	12.913	ug/L	0.438	3	2	3415	4	KED
	Cu	63	38.004	ug/L	1.334	3	55	180519	2	KED
	Cu	65	38.560	ug/L	0.660	1	22	93476	1	KED
	Zn	66	61.441	ug/L	2.700	4	82	37242	1	KED
	Zn	67	63.047	ug/L	0.943	1	13	6624	1	KED
	As	75	2.530	ug/L	0.078	3	4	842	1	KED
	Kr	83		ug/L			36	111	14	Standard
>	In-1	115		ug/L			9347	10050	1	KED
	Cd	111	0.098	ug/L	0.027	27	5	33	22	KED
	Cd	114	0.105	ug/L	0.021	20	3	81	20	KED
>	Tb	159		ug/L			109925	125027	1	Standard
	Pb	208	6.423	ug/L	0.155	2	113	287294	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-17
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:53:21
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	40670	0	Standard
>	Sc	45		ug/L			555694	744240	1	Standard
	Cr	52	15.117	ug/L	0.361	2	17664	412787	1	Standard
	Cr	53	14.799	ug/L	0.092	0	110	45529	1	Standard
>	Ge	72		ug/L			43160	44623	0	KED
	Ni	60	14.762	ug/L	0.109	0	16	24020	1	KED
	Ni	62	15.563	ug/L	0.078	0	2	4036	0	KED
	Cu	63	155.371	ug/L	1.980	1	55	723832	1	KED
	Cu	65	156.110	ug/L	1.620	1	22	371103	1	KED
	Zn	66	115.378	ug/L	1.055	0	82	68554	1	KED
	Zn	67	110.854	ug/L	2.927	2	13	11414	3	KED
	As	75	3.860	ug/L	0.050	1	4	1258	1	KED
	Kr	83		ug/L			36	139	2	Standard
>	In-1	115		ug/L			9347	10019	1	KED
	Cd	111	0.145	ug/L	0.036	24	5	46	22	KED
	Cd	114	0.108	ug/L	0.013	11	3	83	12	KED
>	Tb	159		ug/L			109925	126020	0	Standard
	Pb	208	13.102	ug/L	0.219	1	113	590649	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-18
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 21:57:40
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			26580	36357	1	Standard
>	Sc	45		ug/L			555694	827063	0	Standard
	Cr	52	16.823	ug/L	0.187	1	17664	507608	0	Standard
	Cr	53	16.804	ug/L	0.343	2	110	57426	1	Standard
>	Ge	72		ug/L			43160	45555	0	KED
	Ni	60	19.138	ug/L	0.384	2	16	31783	1	KED
	Ni	62	19.882	ug/L	0.469	2	2	5262	1	KED
	Cu	63	22.002	ug/L	0.165	0	55	104690	1	KED
	Cu	65	22.176	ug/L	0.422	1	22	53835	1	KED
	Zn	66	48.767	ug/L	0.522	1	82	29630	0	KED
	Zn	67	52.721	ug/L	0.578	1	13	5548	0	KED
	As	75	2.223	ug/L	0.057	2	4	741	2	KED
	Kr	83		ug/L			36	159	14	Standard
>	In-1	115		ug/L			9347	9700	1	KED
	Cd	111	0.063	ug/L	0.011	18	5	22	12	KED
	Cd	114	0.080	ug/L	0.006	7	3	60	6	KED
>	Tb	159		ug/L			109925	129340	0	Standard
	Pb	208	3.702	ug/L	0.027	0	113	171383	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0303-19
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 22:01:59
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	42755	1	Standard
>	**Sc**	**45**		ug/L			555694	738747	2	Standard
	Cr	**52**	**12.775**	ug/L	0.440	3	17664	349837	2	Standard
	Cr	**53**	**12.901**	ug/L	0.652	5	110	39384	2	Standard
>	**Ge**	**72**		ug/L			43160	41494	6	KED
	Ni	**60**	**13.186**	ug/L	0.678	5	16	19908	1	KED
	Ni	**62**	**13.499**	ug/L	0.943	6	2	3245	0	KED
	Cu	**63**	**65.958**	ug/L	5.421	8	55	284706	1	KED
	Cu	**65**	**67.126**	ug/L	5.151	7	22	147884	1	KED
	Zn	**66**	**88.090**	ug/L	6.477	7	82	48535	2	KED
	Zn	**67**	**84.880**	ug/L	5.643	6	13	8105	0	KED
	As	**75**	**3.106**	ug/L	0.162	5	4	940	1	KED
	Kr	**83**		ug/L			36	106	12	Standard
>	**In-1**	**115**		ug/L			9347	9961	0	KED
	Cd	**111**	**0.118**	ug/L	0.024	20	5	38	18	KED
	Cd	**114**	**0.130**	ug/L	0.009	7	3	99	7	KED
>	**Tb**	**159**		ug/L			109925	126658	1	Standard
	Pb	**208**	**9.415**	ug/L	0.166	1	113	426637	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLA
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:06:18
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	29088	2	Standard
>	**Sc**	**45**		ug/L			555694	544274	4	Standard
	Cr	**52**	**-0.064**	ug/L	0.057	88	17664	16066	2	Standard
	Cr	**53**	**-0.005**	ug/L	0.003	49	110	96	8	Standard
>	**Ge**	**72**		ug/L			43160	43178	0	KED
	Ni	**60**	**0.009**	ug/L	0.017	189	16	31	89	KED
	Ni	**62**	**0.015**	ug/L	0.011	75	2	6	45	KED
	Cu	**63**	**0.032**	ug/L	0.048	148	55	201	108	KED
	Cu	**65**	**0.031**	ug/L	0.041	131	22	93	100	KED
	Zn	**66**	**0.068**	ug/L	0.101	147	82	121	48	KED
	Zn	**67**	**0.114**	ug/L	0.181	158	13	24	73	KED
	As	**75**	**0.004**	ug/L	0.003	98	4	5	19	KED
	Kr	**83**		ug/L			36	48	28	Standard
>	**In-1**	**115**		ug/L			9347	9732	1	KED
	Cd	**111**	**0.008**	ug/L	0.009	105	5	7	33	KED
	Cd	**114**	**0.002**	ug/L	0.002	71	3	4	25	KED
>	**Tb**	**159**		ug/L			109925	106949	4	Standard
	Pb	**208**	**0.004**	ug/L	0.000	9	113	255	4	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCV9
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:10:37
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25743	1	Standard
>	**Sc**	**45**		ug/L			555694	544656	3	Standard
	Cr	**52**	**49.155**	ug/L	1.325	2	17664	942935	0	Standard
	Cr	**53**	**47.229**	ug/L	1.375	2	110	106041	1	Standard
>	**Ge**	**72**		ug/L			43160	44480	1	KED
	Ni	**60**	**46.216**	ug/L	1.000	2	16	74913	1	KED
	Ni	**62**	**46.566**	ug/L	0.854	1	2	12031	1	KED
	Cu	**63**	**45.922**	ug/L	0.981	2	55	213273	1	KED
	Cu	**65**	**46.060**	ug/L	0.375	0	22	109162	1	KED
	Zn	**66**	**47.420**	ug/L	1.455	3	82	28129	2	KED
	Zn	**67**	**47.308**	ug/L	0.844	1	13	4862	1	KED
	As	**75**	**47.711**	ug/L	0.626	1	4	15451	0	KED
	Kr	**83**		ug/L			36	57	15	Standard
>	**In-1**	**115**		ug/L			9347	9639	1	KED
	Cd	**111**	**48.939**	ug/L	1.248	2	5	13374	0	KED
	Cd	**114**	**48.108**	ug/L	0.540	1	3	34362	2	KED
>	**Tb**	**159**		ug/L			109925	104896	1	Standard
	Pb	**208**	**51.131**	ug/L	0.652	1	113	1918385	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCB9
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:17:41
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25995	5	Standard
⌈>	**Sc**	**45**		ug/L			555694	525032	1	Standard
|	**Cr**	**52**	**-0.025**	ug/L	0.013	50	17664	16229	0	Standard
⌊	**Cr**	**53**	**0.004**	ug/L	0.000	8	110	113	1	Standard
⌈>	**Ge**	**72**		ug/L			43160	43525	0	KED
|	**Ni**	**60**	**0.003**	ug/L	0.004	157	16	20	32	KED
|	**Ni**	**62**	**0.010**	ug/L	0.004	42	2	5	21	KED
|	**Cu**	**63**	**0.007**	ug/L	0.003	47	55	88	17	KED
|	**Cu**	**65**	**0.007**	ug/L	0.001	16	22	39	7	KED
|	**Zn**	**66**	**0.002**	ug/L	0.024	1105	82	84	16	KED
|	**Zn**	**67**	**0.006**	ug/L	0.073	1291	13	13	51	KED
⌊	**As**	**75**	**0.003**	ug/L	0.005	162	4	5	26	KED
	Kr	**83**		ug/L			36	55	27	Standard
⌈>	**In-1**	**115**		ug/L			9347	10014	0	KED
|	**Cd**	**111**	**0.008**	ug/L	0.010	130	5	7	37	KED
⌊	**Cd**	**114**	**0.006**	ug/L	0.009	142	3	7	84	KED
⌈>	**Tb**	**159**		ug/L			109925	102737	1	Standard
⌊	**Pb**	**208**	**0.004**	ug/L	0.002	63	113	243	37	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-BLK3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:22:00
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	35953	0	Standard
>	**Sc**	**45**		ug/L			555694	547606	1	Standard
	Cr	**52**	**-0.007**	ug/L	0.009	139	17664	17280	0	Standard
	Cr	**53**	**0.011**	ug/L	0.005	43	110	133	7	Standard
>	**Ge**	**72**		ug/L			43160	44911	1	KED
	Ni	**60**	**-0.001**	ug/L	0.007	792	16	15	73	KED
	Ni	**62**	**0.012**	ug/L	0.019	164	2	5	88	KED
	Cu	**63**	**0.049**	ug/L	0.006	11	55	285	9	KED
	Cu	**65**	**0.054**	ug/L	0.013	24	22	153	22	KED
	Zn	**66**	**0.321**	ug/L	0.026	8	82	277	7	KED
	Zn	**67**	**0.277**	ug/L	0.035	12	13	42	9	KED
	As	**75**	**0.003**	ug/L	0.006	214	4	5	35	KED
	Kr	**83**		ug/L			36	59	3	Standard
>	**In-1**	**115**		ug/L			9347	9872	3	KED
	Cd	**111**	**0.002**	ug/L	0.005	198	5	6	24	KED
	Cd	**114**	**0.001**	ug/L	0.005	920	3	3	94	KED
>	**Tb**	**159**		ug/L			109925	105105	1	Standard
	Pb	**208**	**0.004**	ug/L	0.001	21	113	241	12	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-BS3
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:26:20
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	36061	2	Standard
>	**Sc**	**45**		ug/L			555694	536409	6	Standard
	Cr	**52**	**24.556**	ug/L	1.314	5	17664	471638	2	Standard
	Cr	**53**	**24.205**	ug/L	1.699	7	110	53434	0	Standard
>	**Ge**	**72**		ug/L			43160	43771	0	KED
	Ni	**60**	**23.563**	ug/L	0.820	3	16	37592	2	KED
	Ni	**62**	**24.417**	ug/L	0.285	1	2	6209	0	KED
	Cu	**63**	**24.054**	ug/L	0.054	0	55	109963	0	KED
	Cu	**65**	**24.027**	ug/L	0.273	1	22	56048	1	KED
	Zn	**66**	**78.897**	ug/L	2.292	2	82	46005	2	KED
	Zn	**67**	**72.760**	ug/L	2.306	3	13	7353	3	KED
	As	**75**	**24.144**	ug/L	0.236	0	4	7697	1	KED
	Kr	**83**		ug/L			36	54	19	Standard
>	**In-1**	**115**		ug/L			9347	9604	0	KED
	Cd	**111**	**24.899**	ug/L	0.297	1	5	6784	0	KED
	Cd	**114**	**24.775**	ug/L	0.305	1	3	17634	1	KED
>	**Tb**	**159**		ug/L			109925	104383	6	Standard
	Pb	**208**	**26.093**	ug/L	2.007	7	113	971188	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-10
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:30:39
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	36456	2	Standard
>	**Sc**	**45**		ug/L			555694	541269	1	Standard
	Cr	**52**	**0.182**	ug/L	0.008	4	17664	20610	1	Standard
	Cr	**53**	**0.158**	ug/L	0.009	5	110	460	3	Standard
>	**Ge**	**72**		ug/L			43160	44360	0	KED
	Ni	**60**	**0.026**	ug/L	0.014	54	16	58	38	KED
	Ni	**62**	**0.064**	ug/L	0.008	12	2	19	10	KED
	Cu	**63**	**0.233**	ug/L	0.009	3	55	1134	3	KED
	Cu	**65**	**0.216**	ug/L	0.020	9	22	532	8	KED
	Zn	**66**	**0.624**	ug/L	0.029	4	82	452	3	KED
	Zn	**67**	**0.629**	ug/L	0.182	29	13	78	24	KED
	As	**75**	**0.002**	ug/L	0.001	49	4	5	5	KED
	Kr	**83**		ug/L			36	45	25	Standard
>	**In-1**	**115**		ug/L			9347	9916	0	KED
	Cd	**111**	**-0.002**	ug/L	0.009	411	5	4	52	KED
	Cd	**114**	**0.001**	ug/L	0.003	256	3	4	53	KED
>	**Tb**	**159**		ug/L			109925	105496	2	Standard
	Pb	**208**	**0.006**	ug/L	0.001	11	113	320	9	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-DUP5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:34:58
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	36683	1	Standard
>	**Sc**	**45**		ug/L			555694	548106	2	Standard
	Cr	**52**	**0.235**	ug/L	0.017	7	17664	21874	3	Standard
	Cr	**53**	**0.219**	ug/L	0.031	13	110	604	13	Standard
>	**Ge**	**72**		ug/L			43160	43609	2	KED
	Ni	**60**	**0.026**	ug/L	0.004	14	16	58	8	KED
	Ni	**62**	**0.042**	ug/L	0.039	92	2	13	75	KED
	Cu	**63**	**0.202**	ug/L	0.010	4	55	977	6	KED
	Cu	**65**	**0.210**	ug/L	0.018	8	22	510	6	KED
	Zn	**66**	**0.432**	ug/L	0.032	7	82	333	5	KED
	Zn	**67**	**0.390**	ug/L	0.051	12	13	52	10	KED
	As	**75**	**0.000**	ug/L	0.006	2106	4	4	41	KED
	Kr	**83**		ug/L			36	55	32	Standard
>	**In-1**	**115**		ug/L			9347	9482	1	KED
	Cd	**111**	**0.024**	ug/L	0.024	98	5	11	55	KED
	Cd	**114**	**0.024**	ug/L	0.036	150	3	20	128	KED
>	**Tb**	**159**		ug/L			109925	104472	0	Standard
	Pb	**208**	**0.023**	ug/L	0.030	130	113	954	115	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-MS5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:39:17
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	38142	1	Standard
>	**Sc**	**45**		ug/L			555694	536838	0	Standard
	Cr	**52**	**24.808**	ug/L	0.678	2	17664	477731	2	Standard
	Cr	**53**	**23.876**	ug/L	0.519	2	110	52919	2	Standard
>	**Ge**	**72**		ug/L			43160	41893	1	KED
	Ni	**60**	**24.073**	ug/L	0.738	3	16	36764	3	KED
	Ni	**62**	**24.784**	ug/L	0.577	2	2	6031	1	KED
	Cu	**63**	**24.473**	ug/L	0.538	2	55	107046	0	KED
	Cu	**65**	**24.510**	ug/L	0.765	3	22	54696	1	KED
	Zn	**66**	**77.180**	ug/L	1.509	1	82	43089	3	KED
	Zn	**67**	**71.004**	ug/L	1.087	1	13	6866	0	KED
	As	**75**	**23.937**	ug/L	0.518	2	4	7302	1	KED
	Kr	**83**		ug/L			36	51	14	Standard
>	**In-1**	**115**		ug/L			9347	9108	1	KED
	Cd	**111**	**24.911**	ug/L	0.916	3	5	6433	1	KED
	Cd	**114**	**24.467**	ug/L	0.920	3	3	16506	2	KED
>	**Tb**	**159**		ug/L			109925	105071	0	Standard
	Pb	**208**	**25.751**	ug/L	0.287	1	113	967889	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-MSD5
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:43:36
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	36325	3	Standard
>	**Sc**	**45**		ug/L			555694	536453	1	Standard
	Cr	**52**	**25.075**	ug/L	0.787	3	17664	482283	2	Standard
	Cr	**53**	**24.285**	ug/L	0.757	3	110	53770	1	Standard
>	**Ge**	**72**		ug/L			43160	41486	1	KED
	Ni	**60**	**24.402**	ug/L	0.767	3	16	36895	2	KED
	Ni	**62**	**24.609**	ug/L	1.002	4	2	5930	2	KED
	Cu	**63**	**24.440**	ug/L	0.342	1	55	105884	0	KED
	Cu	**65**	**24.610**	ug/L	0.798	3	22	54401	3	KED
	Zn	**66**	**77.065**	ug/L	2.468	3	82	42585	1	KED
	Zn	**67**	**71.439**	ug/L	3.285	4	13	6840	3	KED
	As	**75**	**24.436**	ug/L	0.850	3	4	7381	2	KED
	Kr	**83**		ug/L			36	54	2	Standard
>	**In-1**	**115**		ug/L			9347	8972	1	KED
	Cd	**111**	**24.631**	ug/L	0.417	1	5	6269	1	KED
	Cd	**114**	**24.973**	ug/L	0.654	2	3	16600	1	KED
>	**Tb**	**159**		ug/L			109925	105685	0	Standard
	Pb	**208**	**25.710**	ug/L	0.656	2	113	971909	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-21
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:47:52
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	39812	3	Standard
>	**Sc**	**45**		ug/L			555694	568338	0	Standard
	Cr	**52**	**0.236**	ug/L	0.038	16	17664	22699	3	Standard
	Cr	**53**	**0.335**	ug/L	0.169	50	110	898	44	Standard
>	**Ge**	**72**		ug/L			43160	43218	1	KED
	Ni	**60**	**0.550**	ug/L	0.033	5	16	882	5	KED
	Ni	**62**	**0.607**	ug/L	0.083	13	2	154	13	KED
	Cu	**63**	**2.567**	ug/L	0.062	2	55	11635	2	KED
	Cu	**65**	**2.627**	ug/L	0.090	3	22	6069	3	KED
	Zn	**66**	**5.165**	ug/L	0.083	1	82	3051	0	KED
	Zn	**67**	**5.578**	ug/L	0.068	1	13	568	1	KED
	As	**75**	**0.053**	ug/L	0.009	17	4	21	15	KED
	Kr	**83**		ug/L			36	43	14	Standard
>	**In-1**	**115**		ug/L			9347	9611	1	KED
	Cd	**111**	**0.067**	ug/L	0.016	24	5	23	18	KED
	Cd	**114**	**0.041**	ug/L	0.011	27	3	32	25	KED
>	**Tb**	**159**		ug/L			109925	109324	2	Standard
	Pb	**208**	**0.023**	ug/L	0.001	4	113	1011	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-39
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 22:52:11
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	39605	4	Standard
>	**Sc**	**45**		ug/L			555694	558867	2	Standard
	Cr	**52**	**0.285**	ug/L	0.038	13	17664	23260	2	Standard
	Cr	**53**	**0.259**	ug/L	0.019	7	110	706	4	Standard
>	**Ge**	**72**		ug/L			43160	43280	1	KED
	Ni	**60**	**0.184**	ug/L	0.004	2	16	307	0	KED
	Ni	**62**	**0.190**	ug/L	0.024	12	2	50	10	KED
	Cu	**63**	**0.517**	ug/L	0.025	4	55	2390	4	KED
	Cu	**65**	**0.509**	ug/L	0.017	3	22	1194	2	KED
	Zn	**66**	**3.621**	ug/L	0.142	3	82	2167	4	KED
	Zn	**67**	**3.331**	ug/L	0.167	5	13	345	3	KED
	As	**75**	**0.025**	ug/L	0.005	18	4	12	13	KED
	Kr	**83**		ug/L			36	51	3	Standard
>	**In-1**	**115**		ug/L			9347	9609	0	KED
	Cd	**111**	**0.011**	ug/L	0.017	155	5	8	56	KED
	Cd	**114**	**0.020**	ug/L	0.008	40	3	17	34	KED
>	**Tb**	**159**		ug/L			109925	109971	3	Standard
	Pb	**208**	**0.076**	ug/L	0.003	4	113	3120	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0627-01
Sample Dil Factor: 20
Comments:
Sample Date/Time: Friday, July 14, 2023 22:56:54
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	39255	0	Standard
>	**Sc**	**45**		ug/L			555694	603787	2	Standard
	Cr	**52**	**9.334**	ug/L	0.440	4	17664	214074	3	Standard
	Cr	**53**	**9.435**	ug/L	0.210	2	110	23590	3	Standard
>	**Ge**	**72**		ug/L			43160	41478	2	KED
	Ni	**60**	**12.423**	ug/L	0.133	1	16	18792	2	KED
	Ni	**62**	**12.884**	ug/L	0.386	2	2	3105	2	KED
	Cu	**63**	**24.669**	ug/L	0.120	0	55	106860	1	KED
	Cu	**65**	**25.342**	ug/L	0.488	1	22	56000	0	KED
	Zn	**66**	**134.525**	ug/L	1.370	1	82	74273	1	KED
	Zn	**67**	**127.579**	ug/L	2.973	2	13	12203	0	KED
	As	**75**	**2.292**	ug/L	0.076	3	4	696	1	KED
	Kr	**83**		ug/L			36	72	19	Standard
>	**In-1**	**115**		ug/L			9347	8921	1	KED
	Cd	**111**	**0.243**	ug/L	0.028	11	5	66	11	KED
	Cd	**114**	**0.226**	ug/L	0.015	6	3	152	7	KED
>	**Tb**	**159**		ug/L			109925	120409	2	Standard
	Pb	**208**	**6.952**	ug/L	0.189	2	113	299399	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLB
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:01:13
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	27653	2	Standard
>	**Sc**	**45**		ug/L			555694	535582	1	Standard
	Cr	**52**	**-0.055**	ug/L	0.013	23	17664	15998	1	Standard
	Cr	**53**	**-0.005**	ug/L	0.005	96	110	95	12	Standard
>	**Ge**	**72**		ug/L			43160	41474	1	KED
	Ni	**60**	**-0.003**	ug/L	0.000	3	16	11	0	KED
	Ni	**62**	**0.000**	ug/L	0.009	2578	2	2	86	KED
	Cu	**63**	**0.003**	ug/L	0.001	38	55	64	6	KED
	Cu	**65**	**0.008**	ug/L	0.005	60	22	38	27	KED
	Zn	**66**	**-0.015**	ug/L	0.023	158	82	71	17	KED
	Zn	**67**	**0.025**	ug/L	0.058	232	13	15	37	KED
	As	**75**	**0.000**	ug/L	0.006	6448	4	4	38	KED
	Kr	**83**		ug/L			36	45	17	Standard
>	**In-1**	**115**		ug/L			9347	9035	0	KED
	Cd	**111**	**0.011**	ug/L	0.015	141	5	7	50	KED
	Cd	**114**	**0.005**	ug/L	0.003	62	3	6	32	KED
>	**Tb**	**159**		ug/L			109925	104829	2	Standard
	Pb	**208**	**0.005**	ug/L	0.001	17	113	287	11	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCVA
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:05:32
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	25629	1	Standard
>	**Sc**	**45**		ug/L			555694	544981	0	Standard
	Cr	**52**	**48.464**	ug/L	0.416	0	17664	931004	0	Standard
	Cr	**53**	**47.128**	ug/L	0.603	1	110	105932	1	Standard
>	**Ge**	**72**		ug/L			43160	41180	0	KED
	Ni	**60**	**48.219**	ug/L	1.408	2	16	72359	2	KED
	Ni	**62**	**48.031**	ug/L	0.907	1	2	11490	2	KED
	Cu	**63**	**49.174**	ug/L	2.203	4	55	211385	3	KED
	Cu	**65**	**49.498**	ug/L	0.869	1	22	108590	0	KED
	Zn	**66**	**50.063**	ug/L	0.734	1	82	27493	0	KED
	Zn	**67**	**48.458**	ug/L	0.728	1	13	4610	0	KED
	As	**75**	**49.261**	ug/L	0.892	1	4	14769	1	KED
	Kr	**83**		ug/L			36	59	3	Standard
>	**In-1**	**115**		ug/L			9347	9016	0	KED
	Cd	**111**	**50.013**	ug/L	0.315	0	5	12787	0	KED
	Cd	**114**	**49.432**	ug/L	0.679	1	3	33024	0	KED
>	**Tb**	**159**		ug/L			109925	104080	0	Standard
	Pb	**208**	**51.136**	ug/L	0.556	1	113	1903840	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCBA
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:12:36
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			26580	24611	0	Standard
>	**Sc**	**45**		ug/L			555694	521403	0	Standard
	Cr	**52**	**-0.023**	ug/L	0.004	18	17664	16164	0	Standard
	Cr	**53**	**0.003**	ug/L	0.005	186	110	109	10	Standard
>	**Ge**	**72**		ug/L			43160	41538	0	KED
	Ni	**60**	**0.004**	ug/L	0.005	124	16	22	35	KED
	Ni	**62**	**0.008**	ug/L	0.020	239	2	4	107	KED
	Cu	**63**	**0.003**	ug/L	0.004	146	55	64	26	KED
	Cu	**65**	**0.006**	ug/L	0.002	33	22	35	13	KED
	Zn	**66**	**0.017**	ug/L	0.026	150	82	88	16	KED
	Zn	**67**	**0.058**	ug/L	0.011	19	13	18	5	KED
	As	**75**	**-0.001**	ug/L	0.002	179	4	3	13	KED
	Kr	**83**		ug/L			36	38	30	Standard
>	**In-1**	**115**		ug/L			9347	9053	2	KED
	Cd	**111**	**0.007**	ug/L	0.015	218	5	6	57	KED
	Cd	**114**	**0.008**	ug/L	0.007	87	3	8	54	KED
>	**Tb**	**159**		ug/L			109925	101768	1	Standard
	Pb	**208**	**0.002**	ug/L	0.000	16	113	190	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CAL1
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:16:55
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L				25006	3	Standard
⌈>	**Sc**	**45**		ug/L				528830	5	Standard
|	**Cr**	**52**		ug/L				15942	2	Standard
⌊	**Cr**	**53**		ug/L				99	4	Standard
⌈>	**Ge**	**72**		ug/L				43452	2	KED
|	**Ni**	**60**		ug/L				21	39	KED
|	**Ni**	**62**		ug/L				5	86	KED
|	**Cu**	**63**		ug/L				67	20	KED
|	**Cu**	**65**		ug/L				43	18	KED
|	**Zn**	**66**		ug/L				101	12	KED
|	**Zn**	**67**		ug/L				16	24	KED
⌊	**As**	**75**		ug/L				4	40	KED
	Kr	**83**		ug/L				51	23	Standard
⌈>	**In-1**	**115**		ug/L				9668	0	KED
|	**Cd**	**111**		ug/L				7	45	KED
⌊	**Cd**	**114**		ug/L				6	67	KED
⌈>	**Tb**	**159**		ug/L				105208	2	Standard
⌊	**Pb**	**208**		ug/L				164	17	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCVB
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:21:14
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24724	1	Standard
>	**Sc**	**45**		ug/L			528830	539823	1	Standard
	Cr	**52**	**48.040**	ug/L	1.108	2	15942	913502	3	Standard
	Cr	**53**	**48.083**	ug/L	0.657	1	99	107055	2	Standard
>	**Ge**	**72**		ug/L			43452	41924	0	KED
	Ni	**60**	**47.321**	ug/L	0.324	0	21	72313	0	KED
	Ni	**62**	**48.019**	ug/L	1.242	2	5	11698	2	KED
	Cu	**63**	**47.749**	ug/L	1.125	2	67	209033	2	KED
	Cu	**65**	**47.924**	ug/L	1.599	3	43	107061	3	KED
	Zn	**66**	**48.595**	ug/L	0.673	1	101	27190	1	KED
	Zn	**67**	**48.421**	ug/L	1.134	2	16	4694	2	KED
	As	**75**	**48.686**	ug/L	0.850	1	4	14862	1	KED
	Kr	**83**		ug/L			51	53	15	Standard
>	**In-1**	**115**		ug/L			9668	9287	3	KED
	Cd	**111**	**49.382**	ug/L	1.597	3	7	12999	0	KED
	Cd	**114**	**49.220**	ug/L	1.512	3	6	33855	0	KED
>	**Tb**	**159**		ug/L			105208	105916	1	Standard
	Pb	**208**	**50.897**	ug/L	1.216	2	164	1928084	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCBB
Sample Dil Factor:
Comments:
Sample Date/Time: Friday, July 14, 2023 23:28:18
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24867	1	Standard
>	**Sc**	**45**		ug/L			528830	534267	2	Standard
	Cr	**52**	**0.020**	ug/L	0.008	38	15942	16470	1	Standard
	Cr	**53**	**0.000**	ug/L	0.006	1784	99	101	14	Standard
>	**Ge**	**72**		ug/L			43452	41616	0	KED
	Ni	**60**	**-0.001**	ug/L	0.003	319	21	19	26	KED
	Ni	**62**	**-0.012**	ug/L	0.008	64	5	1	100	KED
	Cu	**63**	**0.000**	ug/L	0.002	2163	67	64	10	KED
	Cu	**65**	**0.001**	ug/L	0.001	232	43	43	6	KED
	Zn	**66**	**-0.014**	ug/L	0.015	107	101	89	9	KED
	Zn	**67**	**0.014**	ug/L	0.086	630	16	17	48	KED
	As	**75**	**0.001**	ug/L	0.003	289	4	4	22	KED
	Kr	**83**		ug/L			51	50	28	Standard
>	**In-1**	**115**		ug/L			9668	9169	0	KED
	Cd	**111**	**-0.006**	ug/L	0.006	110	7	5	28	KED
	Cd	**114**	**-0.000**	ug/L	0.009	4532	6	6	100	KED
>	**Tb**	**159**		ug/L			105208	105086	0	Standard
	Pb	**208**	**0.001**	ug/L	0.001	56	164	214	12	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-14
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:32:38
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	26977	5	Standard
>	**Sc**	**45**		ug/L			528830	534411	0	Standard
	Cr	**52**	**0.033**	ug/L	0.025	75	15942	16722	1	Standard
	Cr	**53**	**0.005**	ug/L	0.005	89	99	111	7	Standard
>	**Ge**	**72**		ug/L			43452	42524	1	KED
	Ni	**60**	**0.239**	ug/L	0.022	9	21	390	6	KED
	Ni	**62**	**0.365**	ug/L	0.015	4	5	95	5	KED
	Cu	**63**	**84.842**	ug/L	1.319	1	67	376630	1	KED
	Cu	**65**	**86.677**	ug/L	1.427	1	43	196353	1	KED
	Zn	**66**	**50.638**	ug/L	1.342	2	101	28726	0	KED
	Zn	**67**	**45.031**	ug/L	1.328	2	16	4427	1	KED
	As	**75**	**0.001**	ug/L	0.003	230	4	4	21	KED
	Kr	**83**		ug/L			51	40	5	Standard
>	**In-1**	**115**		ug/L			9668	9558	1	KED
	Cd	**111**	**0.436**	ug/L	0.036	8	7	125	6	KED
	Cd	**114**	**0.455**	ug/L	0.052	11	6	328	12	KED
>	**Tb**	**159**		ug/L			105208	106653	1	Standard
	Pb	**208**	**0.009**	ug/L	0.001	7	164	514	5	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-16
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:36:57
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	28485	2	Standard
>	**Sc**	**45**		ug/L			528830	539127	2	Standard
	Cr	**52**	**0.029**	ug/L	0.028	94	15942	16788	1	Standard
	Cr	**53**	**0.003**	ug/L	0.003	81	99	108	4	Standard
>	**Ge**	**72**		ug/L			43452	44385	0	KED
	Ni	**60**	**0.098**	ug/L	0.000	0	21	180	1	KED
	Ni	**62**	**0.184**	ug/L	0.023	12	5	52	11	KED
	Cu	**63**	**29.474**	ug/L	0.070	0	67	136630	1	KED
	Cu	**65**	**30.424**	ug/L	0.606	1	43	71968	1	KED
	Zn	**66**	**35.428**	ug/L	0.153	0	101	21014	0	KED
	Zn	**67**	**31.393**	ug/L	0.209	0	16	3227	0	KED
	As	**75**	**0.004**	ug/L	0.001	33	4	5	8	KED
	Kr	**83**		ug/L			51	34	22	Standard
>	**In-1**	**115**		ug/L			9668	9839	1	KED
	Cd	**111**	**0.240**	ug/L	0.013	5	7	74	5	KED
	Cd	**114**	**0.246**	ug/L	0.014	5	6	185	4	KED
>	**Tb**	**159**		ug/L			105208	107354	2	Standard
	Pb	**208**	**0.005**	ug/L	0.001	11	164	370	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-36
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:41:16
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27780	3	Standard
>	**Sc**	**45**		ug/L			528830	548515	0	Standard
	Cr	**52**	**0.016**	ug/L	0.002	11	15942	16838	0	Standard
	Cr	**53**	**0.001**	ug/L	0.005	344	99	106	8	Standard
>	**Ge**	**72**		ug/L			43452	44132	3	KED
	Ni	**60**	**0.122**	ug/L	0.010	8	21	217	7	KED
	Ni	**62**	**0.258**	ug/L	0.072	27	5	71	29	KED
	Cu	**63**	**82.331**	ug/L	1.544	1	67	379218	1	KED
	Cu	**65**	**84.256**	ug/L	2.317	2	43	198010	0	KED
	Zn	**66**	**80.980**	ug/L	1.962	2	101	47607	1	KED
	Zn	**67**	**72.230**	ug/L	2.793	3	16	7356	0	KED
	As	**75**	**-0.002**	ug/L	0.002	99	4	3	12	KED
	Kr	**83**		ug/L			51	45	8	Standard
>	**In-1**	**115**		ug/L			9668	9798	1	KED
	Cd	**111**	**0.580**	ug/L	0.046	7	7	168	6	KED
	Cd	**114**	**0.553**	ug/L	0.011	2	6	408	3	KED
>	**Tb**	**159**		ug/L			105208	103708	1	Standard
	Pb	**208**	**0.006**	ug/L	0.002	23	164	396	14	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-37
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:45:35
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27459	3	Standard
>	**Sc**	**45**		ug/L			528830	547342	2	Standard
	Cr	**52**	**0.026**	ug/L	0.046	179	15942	16976	3	Standard
	Cr	**53**	**0.003**	ug/L	0.001	39	99	109	4	Standard
>	**Ge**	**72**		ug/L			43452	42927	2	KED
	Ni	**60**	**0.131**	ug/L	0.013	10	21	226	9	KED
	Ni	**62**	**0.250**	ug/L	0.044	17	5	67	15	KED
	Cu	**63**	**89.180**	ug/L	1.834	2	67	399581	1	KED
	Cu	**65**	**87.949**	ug/L	1.880	2	43	201086	0	KED
	Zn	**66**	**85.570**	ug/L	2.190	2	101	48933	1	KED
	Zn	**67**	**76.418**	ug/L	1.260	1	16	7574	1	KED
	As	**75**	**-0.002**	ug/L	0.002	125	4	3	19	KED
	Kr	**83**		ug/L			51	43	24	Standard
>	**In-1**	**115**		ug/L			9668	8988	0	KED
	Cd	**111**	**0.579**	ug/L	0.031	5	7	154	4	KED
	Cd	**114**	**0.679**	ug/L	0.014	2	6	458	2	KED
>	**Tb**	**159**		ug/L			105208	106776	1	Standard
	Pb	**208**	**0.012**	ug/L	0.001	7	164	622	4	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-38
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:49:54
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27933	2	Standard
>	**Sc**	**45**		ug/L			528830	560637	2	Standard
	Cr	**52**	**0.018**	ug/L	0.007	38	15942	17245	3	Standard
	Cr	**53**	**-0.002**	ug/L	0.002	139	99	101	3	Standard
>	**Ge**	**72**		ug/L			43452	42660	1	KED
	Ni	**60**	**0.264**	ug/L	0.013	5	21	431	3	KED
	Ni	**62**	**0.421**	ug/L	0.001	0	5	109	1	KED
	Cu	**63**	**92.969**	ug/L	1.212	1	67	414040	0	KED
	Cu	**65**	**93.490**	ug/L	1.612	1	43	212475	1	KED
	Zn	**66**	**57.962**	ug/L	1.294	2	101	32977	1	KED
	Zn	**67**	**51.489**	ug/L	0.446	0	16	5077	0	KED
	As	**75**	**0.001**	ug/L	0.004	468	4	4	24	KED
	Kr	**83**		ug/L			51	43	11	Standard
>	**In-1**	**115**		ug/L			9668	7116	36	KED
	Cd	**111**	**0.627**	ug/L	0.282	44	7	118	0	KED
	Cd	**114**	**0.658**	ug/L	0.299	45	6	314	1	KED
>	**Tb**	**159**		ug/L			105208	106766	0	Standard
	Pb	**208**	**0.007**	ug/L	0.001	8	164	441	5	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-40
Sample Dil Factor: 50
Comments:
Sample Date/Time: Friday, July 14, 2023 23:54:07
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	28569	4	Standard
>	**Sc**	**45**		ug/L			528830	545567	1	Standard
	Cr	**52**	**0.037**	ug/L	0.014	38	15942	17141	1	Standard
	Cr	**53**	**0.005**	ug/L	0.002	44	99	113	5	Standard
>	**Ge**	**72**		ug/L			43452	42498	0	KED
	Ni	**60**	**0.246**	ug/L	0.029	11	21	402	10	KED
	Ni	**62**	**0.435**	ug/L	0.064	14	5	112	13	KED
	Cu	**63**	**93.800**	ug/L	1.749	1	67	416221	2	KED
	Cu	**65**	**93.924**	ug/L	1.735	1	43	212662	1	KED
	Zn	**66**	**58.473**	ug/L	0.509	0	101	33147	1	KED
	Zn	**67**	**52.083**	ug/L	2.793	5	16	5117	5	KED
	As	**75**	**-0.000**	ug/L	0.003	1419	4	4	24	KED
	Kr	**83**		ug/L			51	48	12	Standard
>	**In-1**	**115**		ug/L			9668	9236	2	KED
	Cd	**111**	**0.537**	ug/L	0.055	10	7	147	9	KED
	Cd	**114**	**0.476**	ug/L	0.015	3	6	331	0	KED
>	**Tb**	**159**		ug/L			105208	106513	1	Standard
	Pb	**208**	**0.005**	ug/L	0.001	21	164	368	12	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-04
Sample Dil Factor: 10
Comments:
Sample Date/Time: Friday, July 14, 2023 23:58:50
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	26707	1	Standard
>	**Sc**	**45**		ug/L			528830	538687	1	Standard
	Cr	**52**	**0.024**	ug/L	0.008	32	15942	16677	1	Standard
	Cr	**53**	**0.057**	ug/L	0.002	3	99	228	2	Standard
>	**Ge**	**72**		ug/L			43452	41017	1	KED
	Ni	**60**	**0.151**	ug/L	0.003	2	21	246	1	KED
	Ni	**62**	**0.134**	ug/L	0.047	34	5	36	31	KED
	Cu	**63**	**0.369**	ug/L	0.011	2	67	1643	3	KED
	Cu	**65**	**0.371**	ug/L	0.039	10	43	851	8	KED
	Zn	**66**	**115.391**	ug/L	1.300	1	101	63035	1	KED
	Zn	**67**	**102.958**	ug/L	1.173	1	16	9746	0	KED
	As	**75**	**0.006**	ug/L	0.006	112	4	5	33	KED
	Kr	**83**		ug/L			51	50	15	Standard
>	**In-1**	**115**		ug/L			9668	8893	0	KED
	Cd	**111**	**0.150**	ug/L	0.017	11	7	44	9	KED
	Cd	**114**	**0.151**	ug/L	0.028	18	6	105	17	KED
>	**Tb**	**159**		ug/L			105208	101040	1	Standard
	Pb	**208**	**0.013**	ug/L	0.001	9	164	614	8	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-24
Sample Dil Factor: 10
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:03:03
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27656	5	Standard
>	**Sc**	**45**		ug/L			528830	552756	1	Standard
	Cr	**52**	**0.015**	ug/L	0.003	22	15942	16958	1	Standard
	Cr	**53**	**0.012**	ug/L	0.007	56	99	131	11	Standard
>	**Ge**	**72**		ug/L			43452	42838	2	KED
	Ni	**60**	**5.237**	ug/L	0.066	1	21	8195	1	KED
	Ni	**62**	**5.644**	ug/L	0.270	4	5	1408	2	KED
	Cu	**63**	**41.938**	ug/L	0.954	2	67	187548	0	KED
	Cu	**65**	**41.287**	ug/L	1.197	2	43	94224	1	KED
	Zn	**66**	**112.555**	ug/L	3.243	2	101	64194	0	KED
	Zn	**67**	**101.770**	ug/L	2.863	2	16	10058	0	KED
	As	**75**	**0.009**	ug/L	0.005	58	4	6	21	KED
	Kr	**83**		ug/L			51	43	15	Standard
>	**In-1**	**115**		ug/L			9668	9186	1	KED
	Cd	**111**	**0.910**	ug/L	0.046	5	7	244	3	KED
	Cd	**114**	**0.924**	ug/L	0.026	2	6	635	4	KED
>	**Tb**	**159**		ug/L			105208	108154	2	Standard
	Pb	**208**	**0.009**	ug/L	0.000	4	164	535	5	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-31
Sample Dil Factor: 10
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:07:22
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27908	1	Standard
>	**Sc**	**45**		ug/L			528830	541425	2	Standard
	Cr	**52**	**0.001**	ug/L	0.034	2423	15942	16338	1	Standard
	Cr	**53**	**0.018**	ug/L	0.002	12	99	141	5	Standard
>	**Ge**	**72**		ug/L			43452	41728	2	KED
	Ni	**60**	**7.555**	ug/L	0.357	4	21	11498	2	KED
	Ni	**62**	**7.610**	ug/L	0.047	0	5	1849	2	KED
	Cu	**63**	**11.361**	ug/L	0.227	1	67	49542	2	KED
	Cu	**65**	**11.520**	ug/L	0.514	4	43	25626	1	KED
	Zn	**66**	**109.601**	ug/L	3.396	3	101	60881	0	KED
	Zn	**67**	**97.296**	ug/L	3.179	3	16	9366	1	KED
	As	**75**	**0.020**	ug/L	0.015	73	4	10	45	KED
	Kr	**83**		ug/L			51	45	11	Standard
>	**In-1**	**115**		ug/L			9668	9075	3	KED
	Cd	**111**	**1.562**	ug/L	0.057	3	7	408	3	KED
	Cd	**114**	**1.595**	ug/L	0.091	5	6	1079	7	KED
>	**Tb**	**159**		ug/L			105208	107254	0	Standard
	Pb	**208**	**0.022**	ug/L	0.000	1	164	999	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLC
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:11:41
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	26615	3	Standard
>	**Sc**	**45**		ug/L			528830	512768	8	Standard
	Cr	**52**	**0.036**	ug/L	0.031	84	15942	16067	4	Standard
	Cr	**53**	**-0.006**	ug/L	0.006	100	99	83	19	Standard
>	**Ge**	**72**		ug/L			43452	40252	1	KED
	Ni	**60**	**-0.003**	ug/L	0.001	34	21	15	12	KED
	Ni	**62**	**-0.007**	ug/L	0.005	71	5	3	34	KED
	Cu	**63**	**-0.002**	ug/L	0.003	127	67	53	17	KED
	Cu	**65**	**-0.004**	ug/L	0.001	27	43	31	9	KED
	Zn	**66**	**-0.038**	ug/L	0.018	46	101	73	14	KED
	Zn	**67**	**-0.048**	ug/L	0.045	93	16	10	36	KED
	As	**75**	**0.001**	ug/L	0.002	171	4	4	11	KED
	Kr	**83**		ug/L			51	54	19	Standard
>	**In-1**	**115**		ug/L			9668	8641	1	KED
	Cd	**111**	**-0.010**	ug/L	0.010	98	7	4	53	KED
	Cd	**114**	**0.003**	ug/L	0.007	209	6	8	54	KED
>	**Tb**	**159**		ug/L			105208	101305	5	Standard
	Pb	**208**	**0.002**	ug/L	0.000	10	164	248	8	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCVC
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:16:01
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24020	3	Standard
⌈>	**Sc**	**45**		ug/L			528830	533616	1	Standard
|	**Cr**	**52**	**48.230**	ug/L	0.411	0	15942	906386	1	Standard
⌊	**Cr**	**53**	**47.560**	ug/L	0.460	0	99	104669	1	Standard
⌈>	**Ge**	**72**		ug/L			43452	42899	0	KED
|	**Ni**	**60**	**46.364**	ug/L	1.132	2	21	72502	2	KED
|	**Ni**	**62**	**46.921**	ug/L	1.349	2	5	11695	2	KED
|	**Cu**	**63**	**47.338**	ug/L	1.513	3	67	212064	3	KED
|	**Cu**	**65**	**47.816**	ug/L	1.296	2	43	109320	3	KED
|	**Zn**	**66**	**48.189**	ug/L	0.690	1	101	27591	1	KED
|	**Zn**	**67**	**46.443**	ug/L	0.759	1	16	4607	2	KED
⌊	**As**	**75**	**47.967**	ug/L	0.657	1	4	14983	1	KED
	Kr	**83**		ug/L			51	48	51	Standard
⌈>	**In-1**	**115**		ug/L			9668	9474	1	KED
|	**Cd**	**111**	**49.123**	ug/L	1.315	2	7	13197	1	KED
⌊	**Cd**	**114**	**48.495**	ug/L	0.833	1	6	34044	1	KED
⌈>	**Tb**	**159**		ug/L			105208	107058	1	Standard
⌊	**Pb**	**208**	**48.920**	ug/L	0.397	0	164	1873457	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCBC
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:23:04
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24066	2	Standard
>	**Sc**	**45**		ug/L			528830	519183	1	Standard
	Cr	**52**	**0.057**	ug/L	0.024	41	15942	16667	2	Standard
	Cr	**53**	**0.003**	ug/L	0.011	396	99	104	24	Standard
>	**Ge**	**72**		ug/L			43452	41710	1	KED
	Ni	**60**	**-0.004**	ug/L	0.006	150	21	14	65	KED
	Ni	**62**	**-0.012**	ug/L	0.008	64	5	1	100	KED
	Cu	**63**	**-0.006**	ug/L	0.002	40	67	38	27	KED
	Cu	**65**	**-0.005**	ug/L	0.001	15	43	30	6	KED
	Zn	**66**	**-0.027**	ug/L	0.028	104	101	82	17	KED
	Zn	**67**	**0.034**	ug/L	0.037	109	16	19	17	KED
	As	**75**	**0.003**	ug/L	0.003	83	4	5	14	KED
	Kr	**83**		ug/L			51	41	29	Standard
>	**In-1**	**115**		ug/L			9668	9129	1	KED
	Cd	**111**	**0.000**	ug/L	0.005	1013	7	7	15	KED
	Cd	**114**	**-0.005**	ug/L	0.002	32	6	2	41	KED
>	**Tb**	**159**		ug/L			105208	102563	3	Standard
	Pb	**208**	**0.008**	ug/L	0.013	154	164	461	101	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-18
Sample Dil Factor: 20
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:27:24
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27728	0	Standard
>	**Sc**	**45**		ug/L			528830	530102	2	Standard
	Cr	**52**	**0.030**	ug/L	0.037	124	15942	16514	1	Standard
	Cr	**53**	**-0.001**	ug/L	0.004	453	99	98	7	Standard
>	**Ge**	**72**		ug/L			43452	42035	1	KED
	Ni	**60**	**0.267**	ug/L	0.018	6	21	429	6	KED
	Ni	**62**	**0.307**	ug/L	0.051	16	5	80	16	KED
	Cu	**63**	**63.290**	ug/L	1.459	2	67	277720	0	KED
	Cu	**65**	**62.856**	ug/L	0.696	1	43	140770	0	KED
	Zn	**66**	**60.919**	ug/L	0.599	0	101	34149	0	KED
	Zn	**67**	**54.233**	ug/L	1.548	2	16	5268	2	KED
	As	**75**	**-0.003**	ug/L	0.001	25	4	3	8	KED
	Kr	**83**		ug/L			51	45	20	Standard
>	**In-1**	**115**		ug/L			9668	9076	3	KED
	Cd	**111**	**0.511**	ug/L	0.004	0	7	138	3	KED
	Cd	**114**	**0.473**	ug/L	0.055	11	6	323	8	KED
>	**Tb**	**159**		ug/L			105208	105696	1	Standard
	Pb	**208**	**0.005**	ug/L	0.001	21	164	358	10	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0365-23
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:31:43
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27806	5	Standard
>	**Sc**	**45**		ug/L			528830	463852	3	Standard
	Cr	**52**	**0.148**	ug/L	0.033	22	15942	16349	0	Standard
	Cr	**53**	**0.179**	ug/L	0.018	10	99	428	4	Standard
>	**Ge**	**72**		ug/L			43452	33959	3	KED
	Ni	**60**	**0.215**	ug/L	0.029	13	21	282	10	KED
	Ni	**62**	**0.244**	ug/L	0.016	6	5	52	4	KED
	Cu	**63**	**0.299**	ug/L	0.016	5	67	1111	2	KED
	Cu	**65**	**0.330**	ug/L	0.021	6	43	629	2	KED
	Zn	**66**	**18.007**	ug/L	1.220	6	101	8198	3	KED
	Zn	**67**	**15.664**	ug/L	1.036	6	16	1236	3	KED
	As	**75**	**0.013**	ug/L	0.009	68	4	6	35	KED
	Kr	**83**		ug/L			51	65	4	Standard
>	**In-1**	**115**		ug/L			9668	7948	0	KED
	Cd	**111**	**0.075**	ug/L	0.009	11	7	23	8	KED
	Cd	**114**	**0.071**	ug/L	0.010	13	6	47	12	KED
>	**Tb**	**159**		ug/L			105208	87011	3	Standard
	Pb	**208**	**0.038**	ug/L	0.001	2	164	1316	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLD
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:35:57
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	27124	1	Standard
>	**Sc**	**45**		ug/L			528830	515035	2	Standard
	Cr	**52**	**0.040**	ug/L	0.015	36	15942	16247	2	Standard
	Cr	**53**	**-0.004**	ug/L	0.004	99	99	87	11	Standard
>	**Ge**	**72**		ug/L			43452	39466	2	KED
	Ni	**60**	**-0.005**	ug/L	0.003	60	21	12	34	KED
	Ni	**62**	**0.002**	ug/L	0.018	805	5	5	78	KED
	Cu	**63**	**-0.001**	ug/L	0.001	94	67	55	12	KED
	Cu	**65**	**-0.004**	ug/L	0.005	114	43	31	33	KED
	Zn	**66**	**-0.042**	ug/L	0.022	53	101	70	18	KED
	Zn	**67**	**-0.060**	ug/L	0.036	60	16	9	34	KED
	As	**75**	**-0.005**	ug/L	0.006	119	4	2	60	KED
	Kr	**83**		ug/L			51	55	28	Standard
>	**In-1**	**115**		ug/L			9668	8994	1	KED
	Cd	**111**	**0.005**	ug/L	0.009	193	7	8	26	KED
	Cd	**114**	**0.004**	ug/L	0.010	271	6	8	75	KED
>	**Tb**	**159**		ug/L			105208	101999	1	Standard
	Pb	**208**	**0.003**	ug/L	0.000	15	164	267	5	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0650-01
Sample Dil Factor: 20
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:40:16
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	79953	2	Standard
>	**Sc**	**45**		ug/L			528830	526273	4	Standard
	Cr	**52**	**2.601**	ug/L	0.138	5	15942	63143	0	Standard
	Cr	**53**	**2.412**	ug/L	0.114	4	99	5322	1	Standard
>	**Ge**	**72**		ug/L			43452	41041	1	KED
	Ni	**60**	**0.671**	ug/L	0.043	6	21	1024	6	KED
	Ni	**62**	**0.678**	ug/L	0.071	10	5	166	10	KED
	Cu	**63**	**0.321**	ug/L	0.009	2	67	1438	3	KED
	Cu	**65**	**0.345**	ug/L	0.024	7	43	794	6	KED
	Zn	**66**	**219.490**	ug/L	2.145	0	101	119898	1	KED
	Zn	**67**	**197.603**	ug/L	2.317	1	16	18703	0	KED
	As	**75**	**0.030**	ug/L	0.013	41	4	13	27	KED
	Kr	**83**		ug/L			51	45	19	Standard
>	**In-1**	**115**		ug/L			9668	9224	2	KED
	Cd	**111**	**0.436**	ug/L	0.021	4	7	121	4	KED
	Cd	**114**	**0.461**	ug/L	0.031	6	6	320	5	KED
>	**Tb**	**159**		ug/L			105208	104262	3	Standard
	Pb	**208**	**0.053**	ug/L	0.002	3	164	2132	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0652-01
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:44:35
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	36925	0	Standard
>	**Sc**	**45**		ug/L			528830	553040	1	Standard
	Cr	**52**	**0.101**	ug/L	0.011	10	15942	18599	2	Standard
	Cr	**53**	**0.641**	ug/L	0.003	0	99	1564	2	Standard
>	**Ge**	**72**		ug/L			43452	39557	1	KED
	Ni	**60**	**3.379**	ug/L	0.008	0	21	4889	0	KED
	Ni	**62**	**3.556**	ug/L	0.075	2	5	821	1	KED
	Cu	**63**	**0.245**	ug/L	0.027	10	67	1072	9	KED
	Cu	**65**	**0.239**	ug/L	0.014	5	43	543	4	KED
	Zn	**66**	**5.719**	ug/L	0.073	1	101	3100	1	KED
	Zn	**67**	**5.933**	ug/L	0.522	8	16	556	9	KED
	As	**75**	**0.274**	ug/L	0.011	4	4	82	4	KED
	Kr	**83**		ug/L			51	44	10	Standard
>	**In-1**	**115**		ug/L			9668	8641	3	KED
	Cd	**111**	**0.020**	ug/L	0.021	105	7	11	46	KED
	Cd	**114**	**0.016**	ug/L	0.010	62	6	16	41	KED
>	**Tb**	**159**		ug/L			105208	98962	2	Standard
	Pb	**208**	**0.019**	ug/L	0.001	7	164	817	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23G0043-01
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:48:54
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			25006	32672	3	Standard
>	Sc	45		ug/L			528830	545138	1	Standard
	Cr	52	6.721	ug/L	0.148	2	15942	143205	3	Standard
	Cr	53	6.808	ug/L	0.555	8	99	15392	8	Standard
>	Ge	72		ug/L			43452	41144	2	KED
	Ni	60	22.547	ug/L	0.879	3	21	33798	0	KED
	Ni	62	22.916	ug/L	1.239	5	5	5475	3	KED
	Cu	63	38.432	ug/L	0.692	1	67	165105	2	KED
	Cu	65	38.371	ug/L	0.650	1	43	84111	1	KED
	Zn	66	87.256	ug/L	1.606	1	101	47821	1	KED
	Zn	67	77.279	ug/L	4.659	6	16	7336	4	KED
	As	75	0.098	ug/L	0.017	16	4	33	15	KED
	Kr	83		ug/L			51	50	18	Standard
>	In-1	115		ug/L			9668	8834	1	KED
	Cd	111	-0.002	ug/L	0.012	486	7	6	48	KED
	Cd	114	0.018	ug/L	0.007	37	6	17	23	KED
>	Tb	159		ug/L			105208	103847	0	Standard
	Pb	208	4.842	ug/L	0.092	1	164	179995	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0673-01
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:53:37
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	35541	3	Standard
>	**Sc**	**45**		ug/L			528830	586519	1	Standard
	Cr	**52**	**0.209**	ug/L	0.016	7	15942	21909	1	Standard
	Cr	**53**	**1.609**	ug/L	0.025	1	99	3997	0	Standard
>	**Ge**	**72**		ug/L			43452	40173	2	KED
	Ni	**60**	**3.982**	ug/L	0.018	0	21	5848	1	KED
	Ni	**62**	**4.264**	ug/L	0.166	3	5	999	3	KED
	Cu	**63**	**1.311**	ug/L	0.016	1	67	5557	1	KED
	Cu	**65**	**1.377**	ug/L	0.020	1	43	2987	3	KED
	Zn	**66**	**1.038**	ug/L	0.066	6	101	648	7	KED
	Zn	**67**	**1.866**	ug/L	0.165	8	16	187	7	KED
	As	**75**	**0.471**	ug/L	0.020	4	4	141	4	KED
	Kr	**83**		ug/L			51	45	12	Standard
>	**In-1**	**115**		ug/L			9668	8662	1	KED
	Cd	**111**	**0.038**	ug/L	0.008	20	7	16	10	KED
	Cd	**114**	**0.035**	ug/L	0.006	16	6	28	13	KED
>	**Tb**	**159**		ug/L			105208	102680	1	Standard
	Pb	**208**	**0.006**	ug/L	0.000	3	164	370	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0246-DUP2
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 00:57:51
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	34395	3	Standard
>	**Sc**	**45**		ug/L			528830	572445	2	Standard
	Cr	**52**	**0.193**	ug/L	0.029	15	15942	21062	1	Standard
	Cr	**53**	**1.632**	ug/L	0.030	1	99	3957	0	Standard
>	**Ge**	**72**		ug/L			43452	42154	0	KED
	Ni	**60**	**3.951**	ug/L	0.105	2	21	6088	1	KED
	Ni	**62**	**3.976**	ug/L	0.023	0	5	978	0	KED
	Cu	**63**	**1.272**	ug/L	0.006	0	67	5662	1	KED
	Cu	**65**	**1.318**	ug/L	0.014	1	43	3002	1	KED
	Zn	**66**	**0.978**	ug/L	0.048	4	101	646	3	KED
	Zn	**67**	**1.549**	ug/L	0.284	18	16	166	15	KED
	As	**75**	**0.439**	ug/L	0.002	0	4	138	1	KED
	Kr	**83**		ug/L			51	39	12	Standard
>	**In-1**	**115**		ug/L			9668	9271	1	KED
	Cd	**111**	**0.033**	ug/L	0.027	80	7	16	45	KED
	Cd	**114**	**0.030**	ug/L	0.008	27	6	26	22	KED
>	**Tb**	**159**		ug/L			105208	100692	2	Standard
	Pb	**208**	**0.004**	ug/L	0.001	20	164	307	11	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0246-MS2
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:02:33
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	36358	1	Standard
>	**Sc**	**45**		ug/L			528830	582212	2	Standard
	Cr	**52**	**10.926**	ug/L	0.304	2	15942	237556	2	Standard
	Cr	**53**	**12.081**	ug/L	0.291	2	99	29078	0	Standard
>	**Ge**	**72**		ug/L			43452	39539	2	KED
	Ni	**60**	**15.766**	ug/L	0.085	0	21	22732	1	KED
	Ni	**62**	**15.919**	ug/L	0.421	2	5	3658	0	KED
	Cu	**63**	**12.939**	ug/L	0.093	0	67	53466	2	KED
	Cu	**65**	**13.195**	ug/L	0.677	5	43	27813	3	KED
	Zn	**66**	**39.160**	ug/L	0.885	2	101	20676	0	KED
	Zn	**67**	**35.448**	ug/L	0.599	1	16	3244	0	KED
	As	**75**	**12.662**	ug/L	0.352	2	4	3647	2	KED
	Kr	**83**		ug/L			51	39	14	Standard
>	**In-1**	**115**		ug/L			9668	8865	0	KED
	Cd	**111**	**12.263**	ug/L	0.363	2	7	3088	2	KED
	Cd	**114**	**12.053**	ug/L	0.327	2	6	7924	3	KED
>	**Tb**	**159**		ug/L			105208	101387	0	Standard
	Pb	**208**	**12.298**	ug/L	0.158	1	164	446104	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:06:53
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	33847	1	Standard
>	**Sc**	**45**		ug/L			528830	519908	1	Standard
	Cr	**52**	**0.064**	ug/L	0.037	56	15942	16825	2	Standard
	Cr	**53**	**0.102**	ug/L	0.004	3	99	315	1	Standard
>	**Ge**	**72**		ug/L			43452	40885	1	KED
	Ni	**60**	**-0.000**	ug/L	0.016	6727	21	19	114	KED
	Ni	**62**	**0.020**	ug/L	0.025	122	5	9	60	KED
	Cu	**63**	**0.012**	ug/L	0.016	135	67	113	58	KED
	Cu	**65**	**0.005**	ug/L	0.002	49	43	52	8	KED
	Zn	**66**	**-0.075**	ug/L	0.049	66	101	54	46	KED
	Zn	**67**	**-0.024**	ug/L	0.150	616	16	13	107	KED
	As	**75**	**0.004**	ug/L	0.015	348	4	5	80	KED
	Kr	**83**		ug/L			51	43	29	Standard
>	**In-1**	**115**		ug/L			9668	8765	2	KED
	Cd	**111**	**0.001**	ug/L	0.020	3980	7	6	69	KED
	Cd	**114**	**-0.006**	ug/L	0.004	74	6	2	124	KED
>	**Tb**	**159**		ug/L			105208	102632	0	Standard
	Pb	**208**	**-0.000**	ug/L	0.000	63	164	148	4	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCVD
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:11:12
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	25009	0	Standard
>	**Sc**	**45**		ug/L			528830	529008	2	Standard
	Cr	**52**	**47.988**	ug/L	1.423	2	15942	893777	0	Standard
	Cr	**53**	**47.216**	ug/L	1.960	4	99	102956	2	Standard
>	**Ge**	**72**		ug/L			43452	40157	2	KED
	Ni	**60**	**47.391**	ug/L	1.006	2	21	69340	0	KED
	Ni	**62**	**48.912**	ug/L	0.729	1	5	11409	1	KED
	Cu	**63**	**47.404**	ug/L	0.234	0	67	198759	2	KED
	Cu	**65**	**48.018**	ug/L	0.400	0	43	102742	1	KED
	Zn	**66**	**48.970**	ug/L	0.908	1	101	26252	4	KED
	Zn	**67**	**49.034**	ug/L	0.930	1	16	4551	1	KED
	As	**75**	**48.871**	ug/L	1.175	2	4	14284	0	KED
	Kr	**83**		ug/L			51	49	13	Standard
>	**In-1**	**115**		ug/L			9668	8867	1	KED
	Cd	**111**	**49.554**	ug/L	0.266	0	7	12463	0	KED
	Cd	**114**	**47.791**	ug/L	0.827	1	6	31402	0	KED
>	**Tb**	**159**		ug/L			105208	102712	2	Standard
	Pb	**208**	**49.836**	ug/L	2.079	4	164	1829684	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCBD
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:18:15
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24088	3	Standard
>	**Sc**	**45**		ug/L			528830	526718	1	Standard
	Cr	**52**	**0.000**	ug/L	0.023	8124	15942	15880	1	Standard
	Cr	**53**	**0.022**	ug/L	0.002	7	99	146	1	Standard
>	**Ge**	**72**		ug/L			43452	40068	1	KED
	Ni	**60**	**-0.005**	ug/L	0.001	27	21	13	14	KED
	Ni	**62**	**0.018**	ug/L	0.019	103	5	8	49	KED
	Cu	**63**	**-0.002**	ug/L	0.002	114	67	53	19	KED
	Cu	**65**	**-0.006**	ug/L	0.004	72	43	27	33	KED
	Zn	**66**	**-0.038**	ug/L	0.013	34	101	73	9	KED
	Zn	**67**	**0.020**	ug/L	0.073	359	16	17	40	KED
	As	**75**	**0.007**	ug/L	0.003	46	4	6	16	KED
	Kr	**83**		ug/L			51	45	21	Standard
>	**In-1**	**115**		ug/L			9668	8999	2	KED
	Cd	**111**	**-0.002**	ug/L	0.009	511	7	6	37	KED
	Cd	**114**	**0.002**	ug/L	0.003	161	6	7	25	KED
>	**Tb**	**159**		ug/L			105208	101499	1	Standard
	Pb	**208**	**-0.001**	ug/L	0.000	41	164	135	7	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0268-DUP1
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:22:35
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			25006	350504	4	Standard
>	Sc	45		ug/L			528830	510573	5	Standard
	Cr	52	2.040	ug/L	0.103	5	15942	51372	3	Standard
	Cr	53	1.148	ug/L	0.080	6	99	2504	1	Standard
>	Ge	72		ug/L			43452	36396	2	KED
	Ni	60	10.237	ug/L	0.399	3	21	13586	1	KED
	Ni	62	10.528	ug/L	0.277	2	5	2229	2	KED
	Cu	63	6.425	ug/L	0.051	0	67	24464	1	KED
	Cu	65	6.474	ug/L	0.255	3	43	12581	1	KED
	Zn	66	22.972	ug/L	0.851	3	101	11198	2	KED
	Zn	67	21.995	ug/L	0.594	2	16	1857	0	KED
	As	75	0.125	ug/L	0.030	24	4	36	19	KED
	Kr	83		ug/L			51	67	15	Standard
>	In-1	115		ug/L			9668	8082	0	KED
	Cd	111	0.065	ug/L	0.009	13	7	21	9	KED
	Cd	114	0.055	ug/L	0.017	32	6	38	27	KED
>	Tb	159		ug/L			105208	97754	2	Standard
	Pb	208	0.796	ug/L	0.031	3	164	27963	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0268-MS1
Sample Dil Factor: 2
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:27:18
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			25006	318426	3	Standard
>	Sc	45		ug/L			528830	495727	1	Standard
	Cr	52	13.364	ug/L	0.327	2	15942	244048	0	Standard
	Cr	53	12.294	ug/L	0.243	1	99	25197	0	Standard
>	Ge	72		ug/L			43452	35969	1	KED
	Ni	60	22.003	ug/L	0.250	1	21	28855	1	KED
	Ni	62	22.562	ug/L	0.612	2	5	4716	2	KED
	Cu	63	19.354	ug/L	0.347	1	67	72711	0	KED
	Cu	65	19.565	ug/L	0.572	2	43	37512	1	KED
	Zn	66	55.879	ug/L	0.588	1	101	26810	1	KED
	Zn	67	52.741	ug/L	2.767	5	16	4382	3	KED
	As	75	13.052	ug/L	0.215	1	4	3420	0	KED
	Kr	83		ug/L			51	55	19	Standard
>	In-1	115		ug/L			9668	8196	1	KED
	Cd	111	11.730	ug/L	0.167	1	7	2732	2	KED
	Cd	114	11.437	ug/L	0.127	1	6	6951	2	KED
>	Tb	159		ug/L			105208	94606	0	Standard
	Pb	208	12.440	ug/L	0.205	1	164	421079	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLF
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:31:38
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	42848	3	Standard
⌈>	**Sc**	**45**		ug/L			528830	489355	5	Standard
|	**Cr**	**52**	**0.110**	ug/L	0.007	6	15942	16611	5	Standard
⌊	**Cr**	**53**	**0.013**	ug/L	0.005	35	99	119	5	Standard
⌈>	**Ge**	**72**		ug/L			43452	40250	1	KED
|	**Ni**	**60**	**0.010**	ug/L	0.024	240	21	34	102	KED
|	**Ni**	**62**	**0.007**	ug/L	0.017	242	5	6	62	KED
|	**Cu**	**63**	**0.021**	ug/L	0.023	111	67	149	66	KED
|	**Cu**	**65**	**0.012**	ug/L	0.021	173	43	67	69	KED
|	**Zn**	**66**	**-0.050**	ug/L	0.104	208	101	67	83	KED
|	**Zn**	**67**	**0.005**	ug/L	0.082	1516	16	15	49	KED
⌊	**As**	**75**	**0.009**	ug/L	0.019	213	4	6	86	KED
	Kr	**83**		ug/L			51	43	15	Standard
⌈>	**In-1**	**115**		ug/L			9668	8858	0	KED
|	**Cd**	**111**	**-0.008**	ug/L	0.009	117	7	5	43	KED
⌊	**Cd**	**114**	**-0.001**	ug/L	0.008	1070	6	5	90	KED
⌈>	**Tb**	**159**		ug/L			105208	95959	3	Standard
⌊	**Pb**	**208**	**0.001**	ug/L	0.001	62	164	180	13	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23F0496-02
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:35:57
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	46738	0	Standard
>	**Sc**	**45**		ug/L			528830	609565	2	Standard
	Cr	**52**	**0.226**	ug/L	0.022	9	15942	23139	0	Standard
	Cr	**53**	**0.323**	ug/L	0.000	0	99	925	2	Standard
>	**Ge**	**72**		ug/L			43452	40030	0	KED
	Ni	**60**	**3.187**	ug/L	0.094	2	21	4668	2	KED
	Ni	**62**	**3.216**	ug/L	0.181	5	5	752	5	KED
	Cu	**63**	**1.167**	ug/L	0.002	0	67	4936	0	KED
	Cu	**65**	**1.205**	ug/L	0.023	1	43	2610	1	KED
	Zn	**66**	**1.562**	ug/L	0.038	2	101	925	1	KED
	Zn	**67**	**5.156**	ug/L	0.498	9	16	490	9	KED
	As	**75**	**0.466**	ug/L	0.044	9	4	139	9	KED
	Kr	**83**		ug/L			51	43	24	Standard
>	**In-1**	**115**		ug/L			9668	9318	2	KED
	Cd	**111**	**0.021**	ug/L	0.009	43	7	13	21	KED
	Cd	**114**	**0.028**	ug/L	0.017	59	6	25	46	KED
>	**Tb**	**159**		ug/L			105208	98312	1	Standard
	Pb	**208**	**0.013**	ug/L	0.001	6	164	596	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-DUP6
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:40:10
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	45418	3	Standard
>	**Sc**	**45**		ug/L			528830	602054	1	Standard
	Cr	**52**	**0.254**	ug/L	0.018	7	15942	23446	1	Standard
	Cr	**53**	**0.340**	ug/L	0.009	2	99	957	2	Standard
>	**Ge**	**72**		ug/L			43452	40477	1	KED
	Ni	**60**	**3.308**	ug/L	0.061	1	21	4899	3	KED
	Ni	**62**	**3.253**	ug/L	0.044	1	5	769	2	KED
	Cu	**63**	**1.187**	ug/L	0.023	1	67	5075	0	KED
	Cu	**65**	**1.174**	ug/L	0.087	7	43	2571	6	KED
	Zn	**66**	**1.630**	ug/L	0.121	7	101	972	8	KED
	Zn	**67**	**4.748**	ug/L	0.571	12	16	457	10	KED
	As	**75**	**0.448**	ug/L	0.028	6	4	136	7	KED
	Kr	**83**		ug/L			51	47	17	Standard
>	**In-1**	**115**		ug/L			9668	9008	1	KED
	Cd	**111**	**0.024**	ug/L	0.033	139	7	13	65	KED
	Cd	**114**	**0.018**	ug/L	0.014	78	6	17	49	KED
>	**Tb**	**159**		ug/L			105208	97760	1	Standard
	Pb	**208**	**0.014**	ug/L	0.001	5	164	629	3	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: BLG0135-MS6
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:44:53
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	42826	0	Standard
>	**Sc**	**45**		ug/L			528830	578758	2	Standard
	Cr	**52**	**21.192**	ug/L	0.364	1	15942	441634	1	Standard
	Cr	**53**	**20.681**	ug/L	0.735	3	99	49397	1	Standard
>	**Ge**	**72**		ug/L			43452	40171	1	KED
	Ni	**60**	**25.916**	ug/L	0.403	1	21	37960	2	KED
	Ni	**62**	**25.923**	ug/L	0.362	1	5	6052	0	KED
	Cu	**63**	**23.425**	ug/L	0.367	1	67	98286	1	KED
	Cu	**65**	**23.473**	ug/L	0.503	2	43	50260	1	KED
	Zn	**66**	**70.522**	ug/L	1.260	1	101	37765	1	KED
	Zn	**67**	**69.135**	ug/L	1.955	2	16	6414	2	KED
	As	**75**	**24.474**	ug/L	0.431	1	4	7159	0	KED
	Kr	**83**		ug/L			51	66	17	Standard
>	**In-1**	**115**		ug/L			9668	9275	3	KED
	Cd	**111**	**22.419**	ug/L	1.063	4	7	5895	1	KED
	Cd	**114**	**23.027**	ug/L	0.522	2	6	15822	1	KED
>	**Tb**	**159**		ug/L			105208	96039	2	Standard
	Pb	**208**	**24.998**	ug/L	0.811	3	164	858513	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLG
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:49:07
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	34183	1	Standard
>	**Sc**	**45**		ug/L			528830	521135	2	Standard
	Cr	**52**	**0.079**	ug/L	0.036	45	15942	17119	1	Standard
	Cr	**53**	**0.011**	ug/L	0.004	31	99	122	5	Standard
>	**Ge**	**72**		ug/L			43452	43446	3	KED
	Ni	**60**	**-0.006**	ug/L	0.001	22	21	12	18	KED
	Ni	**62**	**-0.005**	ug/L	0.014	283	5	3	86	KED
	Cu	**63**	**0.007**	ug/L	0.004	61	67	96	16	KED
	Cu	**65**	**0.002**	ug/L	0.008	500	43	46	35	KED
	Zn	**66**	**-0.092**	ug/L	0.015	15	101	48	18	KED
	Zn	**67**	**-0.108**	ug/L	0.002	1	16	5	0	KED
	As	**75**	**0.003**	ug/L	0.001	25	4	5	5	KED
	Kr	**83**		ug/L			51	36	34	Standard
>	**In-1**	**115**		ug/L			9668	9613	0	KED
	Cd	**111**	**-0.002**	ug/L	0.007	327	7	6	28	KED
	Cd	**114**	**-0.001**	ug/L	0.002	268	6	6	18	KED
>	**Tb**	**159**		ug/L			105208	101836	2	Standard
	Pb	**208**	**0.002**	ug/L	0.000	14	164	236	2	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23G0021-01
Sample Dil Factor: 10
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:53:26
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			25006	83222	3	Standard
>	Sc	45		ug/L			528830	531285	0	Standard
	Cr	52	25.352	ug/L	0.357	1	15942	481971	1	Standard
	Cr	53	24.972	ug/L	0.202	0	99	54764	0	Standard
>	Ge	72		ug/L			43452	43622	0	KED
	Ni	60	0.551	ug/L	0.019	3	21	897	4	KED
	Ni	62	0.526	ug/L	0.038	7	5	138	7	KED
	Cu	63	1.330	ug/L	0.023	1	67	6121	1	KED
	Cu	65	1.299	ug/L	0.038	2	43	3061	2	KED
	Zn	66	126.443	ug/L	1.905	1	101	73449	1	KED
	Zn	67	113.916	ug/L	1.640	1	16	11468	1	KED
	As	75	0.097	ug/L	0.011	11	4	35	9	KED
	Kr	83		ug/L			51	35	26	Standard
>	In-1	115		ug/L			9668	9691	2	KED
	Cd	111	0.371	ug/L	0.022	5	7	109	4	KED
	Cd	114	0.395	ug/L	0.012	3	6	290	1	KED
>	Tb	159		ug/L			105208	102790	0	Standard
	Pb	208	0.427	ug/L	0.011	2	164	15868	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: 23G0001-02
Sample Dil Factor: 5
Comments:
Sample Date/Time: Saturday, July 15, 2023 01:58:09
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	13		ug/L			25006	37460	1	Standard
>	Sc	45		ug/L			528830	582345	1	Standard
	Cr	52	1.383	ug/L	0.072	5	15942	45408	1	Standard
	Cr	53	1.687	ug/L	0.033	1	99	4158	2	Standard
>	Ge	72		ug/L			43452	41861	0	KED
	Ni	60	0.097	ug/L	0.018	18	21	168	14	KED
	Ni	62	0.097	ug/L	0.036	37	5	28	30	KED
	Cu	63	0.556	ug/L	0.021	3	67	2494	4	KED
	Cu	65	0.531	ug/L	0.031	5	43	1226	4	KED
	Zn	66	1.665	ug/L	0.104	6	101	1024	6	KED
	Zn	67	2.441	ug/L	0.213	8	16	251	8	KED
	As	75	0.507	ug/L	0.063	12	4	158	11	KED
	Kr	83		ug/L			51	45	25	Standard
>	In-1	115		ug/L			9668	9231	0	KED
	Cd	111	0.007	ug/L	0.006	75	7	9	15	KED
	Cd	114	0.000	ug/L	0.005	2041	6	6	52	KED
>	Tb	159		ug/L			105208	102595	0	Standard
	Pb	208	0.052	ug/L	0.000	0	164	2083	0	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-IBLH
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:02:23
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	33467	1	Standard
>	**Sc**	**45**		ug/L			528830	521503	1	Standard
	Cr	**52**	**0.016**	ug/L	0.014	88	15942	16014	2	Standard
	Cr	**53**	**0.013**	ug/L	0.005	38	99	126	8	Standard
>	**Ge**	**72**		ug/L			43452	42797	1	KED
	Ni	**60**	**-0.008**	ug/L	0.002	27	21	9	34	KED
	Ni	**62**	**-0.005**	ug/L	0.008	166	5	3	50	KED
	Cu	**63**	**0.003**	ug/L	0.001	49	67	79	7	KED
	Cu	**65**	**0.010**	ug/L	0.008	78	43	66	28	KED
	Zn	**66**	**-0.097**	ug/L	0.015	15	101	45	19	KED
	Zn	**67**	**-0.088**	ug/L	0.019	21	16	7	25	KED
	As	**75**	**0.002**	ug/L	0.009	393	4	4	55	KED
	Kr	**83**		ug/L			51	43	14	Standard
>	**In-1**	**115**		ug/L			9668	9702	1	KED
	Cd	**111**	**-0.013**	ug/L	0.005	41	7	4	35	KED
	Cd	**114**	**0.001**	ug/L	0.007	625	6	7	67	KED
>	**Tb**	**159**		ug/L			105208	102884	1	Standard
	Pb	**208**	**-0.001**	ug/L	0.001	156	164	141	22	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCVE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:06:43
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	25626	2	Standard
⌈>	**Sc**	**45**		ug/L			528830	519565	1	Standard
|	**Cr**	**52**	**48.861**	ug/L	0.781	1	15942	893779	0	Standard
⌊	**Cr**	**53**	**47.628**	ug/L	2.121	4	99	102030	3	Standard
⌈>	**Ge**	**72**		ug/L			43452	43091	1	KED
|	**Ni**	**60**	**45.858**	ug/L	1.624	3	21	71996	1	KED
|	**Ni**	**62**	**46.646**	ug/L	0.753	1	5	11677	0	KED
|	**Cu**	**63**	**46.691**	ug/L	0.994	2	67	210072	2	KED
|	**Cu**	**65**	**46.590**	ug/L	0.118	0	43	106987	1	KED
|	**Zn**	**66**	**48.547**	ug/L	0.761	1	101	27915	0	KED
|	**Zn**	**67**	**47.406**	ug/L	1.267	2	16	4725	4	KED
⌊	**As**	**75**	**48.907**	ug/L	1.015	2	4	15341	0	KED
	Kr	**83**		ug/L			51	47	16	Standard
⌈>	**In-1**	**115**		ug/L			9668	9545	1	KED
|	**Cd**	**111**	**49.048**	ug/L	0.365	0	7	13280	1	KED
⌊	**Cd**	**114**	**48.274**	ug/L	0.365	0	6	34147	0	KED
⌈>	**Tb**	**159**		ug/L			105208	98931	2	Standard
⌊	**Pb**	**208**	**52.810**	ug/L	0.265	0	164	1868825	1	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: SEQ-CCBE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:13:46
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24866	0	Standard
>	**Sc**	**45**		ug/L			528830	512318	2	Standard
	Cr	**52**	**0.040**	ug/L	0.063	156	15942	16143	4	Standard
	Cr	**53**	**0.021**	ug/L	0.023	108	99	140	32	Standard
>	**Ge**	**72**		ug/L			43452	40760	1	KED
	Ni	**60**	**0.001**	ug/L	0.003	215	21	22	17	KED
	Ni	**62**	**0.012**	ug/L	0.028	227	5	7	86	KED
	Cu	**63**	**-0.000**	ug/L	0.002	416	67	61	10	KED
	Cu	**65**	**-0.008**	ug/L	0.004	55	43	24	37	KED
	Zn	**66**	**-0.014**	ug/L	0.039	269	101	87	25	KED
	Zn	**67**	**-0.029**	ug/L	0.045	152	16	12	31	KED
	As	**75**	**0.005**	ug/L	0.003	69	4	5	18	KED
	Kr	**83**		ug/L			51	38	24	Standard
>	**In-1**	**115**		ug/L			9668	9904	0	KED
	Cd	**111**	**-0.002**	ug/L	0.008	459	7	7	32	KED
	Cd	**114**	**-0.000**	ug/L	0.003	3552	6	6	34	KED
>	**Tb**	**159**		ug/L			105208	100225	1	Standard
	Pb	**208**	**0.011**	ug/L	0.020	184	164	532	129	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: RINSE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:18:05
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	28827	2	Standard
⌈>	**Sc**	**45**		ug/L			528830	595072	2	Standard
|	**Cr**	**52**	**0.046**	ug/L	0.022	48	15942	18883	1	Standard
⌊	**Cr**	**53**	**-0.001**	ug/L	0.007	449	99	108	12	Standard
⌈>	**Ge**	**72**		ug/L			43452	46341	3	KED
|	**Ni**	**60**	**-0.008**	ug/L	0.004	48	21	10	65	KED
|	**Ni**	**62**	**-0.008**	ug/L	0.004	47	5	3	34	KED
|	**Cu**	**63**	**0.001**	ug/L	0.003	261	67	76	13	KED
|	**Cu**	**65**	**-0.007**	ug/L	0.003	47	43	30	22	KED
|	**Zn**	**66**	**0.062**	ug/L	0.011	18	101	146	3	KED
|	**Zn**	**67**	**0.110**	ug/L	0.081	73	16	29	27	KED
⌊	**As**	**75**	**0.009**	ug/L	0.008	94	4	7	35	KED
	Kr	**83**		ug/L			51	48	11	Standard
⌈>	**In-1**	**115**		ug/L			9668	10640	1	KED
|	**Cd**	**111**	**-0.014**	ug/L	0.005	35	7	4	35	KED
⌊	**Cd**	**114**	**-0.000**	ug/L	0.006	20833	6	7	69	KED
⌈>	**Tb**	**159**		ug/L			105208	110123	1	Standard
⌊	**Pb**	**208**	**0.001**	ug/L	0.001	53	164	228	11	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: RINSE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:22:25
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	29046	3	Standard
⌈>	**Sc**	**45**		ug/L			528830	598497	2	Standard
|	**Cr**	**52**	**0.042**	ug/L	0.029	69	15942	18902	0	Standard
⌊	**Cr**	**53**	**-0.007**	ug/L	0.004	50	99	95	11	Standard
⌈>	**Ge**	**72**		ug/L			43452	45532	1	KED
|	**Ni**	**60**	**-0.006**	ug/L	0.001	8	21	12	9	KED
|	**Ni**	**62**	**0.006**	ug/L	0.023	368	5	6	87	KED
|	**Cu**	**63**	**-0.003**	ug/L	0.005	164	67	55	45	KED
|	**Cu**	**65**	**-0.007**	ug/L	0.005	67	43	28	40	KED
|	**Zn**	**66**	**0.043**	ug/L	0.018	42	101	132	8	KED
|	**Zn**	**67**	**0.005**	ug/L	0.094	1913	16	17	54	KED
⌊	**As**	**75**	**-0.002**	ug/L	0.005	332	4	3	45	KED
	Kr	**83**		ug/L			51	43	32	Standard
⌈>	**In-1**	**115**		ug/L			9668	10787	0	KED
|	**Cd**	**111**	**-0.006**	ug/L	0.008	139	7	6	37	KED
⌊	**Cd**	**114**	**0.001**	ug/L	0.004	246	6	8	33	KED
⌈>	**Tb**	**159**		ug/L			105208	111342	2	Standard
⌊	**Pb**	**208**	**0.001**	ug/L	0.000	42	164	214	8	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: RINSE
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:26:44
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	29834	4	Standard
>	**Sc**	**45**		ug/L			528830	568252	15	Standard
	Cr	**52**	**0.097**	ug/L	0.148	152	15942	18734	1	Standard
	Cr	**53**	**-0.000**	ug/L	0.003	878	99	105	10	Standard
>	**Ge**	**72**		ug/L			43452	45335	3	KED
	Ni	**60**	**-0.010**	ug/L	0.002	23	21	5	66	KED
	Ni	**62**	**0.006**	ug/L	0.019	289	5	6	68	KED
	Cu	**63**	**-0.002**	ug/L	0.001	60	67	60	10	KED
	Cu	**65**	**-0.007**	ug/L	0.002	34	43	28	17	KED
	Zn	**66**	**0.046**	ug/L	0.024	51	101	133	7	KED
	Zn	**67**	**0.017**	ug/L	0.029	169	16	19	17	KED
	As	**75**	**0.002**	ug/L	0.006	279	4	5	41	KED
	Kr	**83**		ug/L			51	45	13	Standard
>	**In-1**	**115**		ug/L			9668	10776	1	KED
	Cd	**111**	**-0.002**	ug/L	0.002	86	7	7	6	KED
	Cd	**114**	**-0.001**	ug/L	0.008	823	6	6	89	KED
>	**Tb**	**159**		ug/L			105208	105736	11	Standard
	Pb	**208**	**0.000**	ug/L	0.001	293	164	174	6	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: DI
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:31:03
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24839	4	Standard
>	**Sc**	**45**		ug/L			528830	490508	2	Standard
	Cr	**52**	**0.003**	ug/L	0.039	1191	15942	14832	2	Standard
	Cr	**53**	**-0.003**	ug/L	0.008	243	99	85	17	Standard
>	**Ge**	**72**		ug/L			43452	41553	2	KED
	Ni	**60**	**-0.012**	ug/L	0.001	6	21	3	34	KED
	Ni	**62**	**-0.010**	ug/L	0.005	47	5	2	43	KED
	Cu	**63**	**-0.007**	ug/L	0.002	29	67	34	24	KED
	Cu	**65**	**-0.013**	ug/L	0.002	12	43	12	31	KED
	Zn	**66**	**-0.092**	ug/L	0.007	7	101	46	10	KED
	Zn	**67**	**-0.086**	ug/L	0.052	60	16	7	66	KED
	As	**75**	**-0.001**	ug/L	0.005	567	4	3	43	KED
	Kr	**83**		ug/L			51	45	25	Standard
>	**In-1**	**115**		ug/L			9668	9405	0	KED
	Cd	**111**	**-0.005**	ug/L	0.004	75	7	6	18	KED
	Cd	**114**	**0.001**	ug/L	0.005	376	6	7	48	KED
>	**Tb**	**159**		ug/L			105208	96629	1	Standard
	Pb	**208**	**-0.001**	ug/L	0.000	17	164	102	8	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: DI
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:35:23
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24767	1	Standard
⌈>	**Sc**	**45**		ug/L			528830	491721	1	Standard
|	**Cr**	**52**	**0.010**	ug/L	0.026	248	15942	14995	1	Standard
⌊	**Cr**	**53**	**-0.002**	ug/L	0.001	41	99	88	2	Standard
⌈>	**Ge**	**72**		ug/L			43452	42292	2	KED
|	**Ni**	**60**	**-0.011**	ug/L	0.001	13	21	4	49	KED
|	**Ni**	**62**	**-0.015**	ug/L	0.009	59	5	1	173	KED
|	**Cu**	**63**	**-0.010**	ug/L	0.001	15	67	23	28	KED
|	**Cu**	**65**	**-0.015**	ug/L	0.001	9	43	8	35	KED
|	**Zn**	**66**	**-0.099**	ug/L	0.012	12	101	43	17	KED
|	**Zn**	**67**	**-0.080**	ug/L	0.041	51	16	8	48	KED
⌊	**As**	**75**	**-0.002**	ug/L	0.002	143	4	3	19	KED
	Kr	**83**		ug/L			51	36	15	Standard
⌈>	**In-1**	**115**		ug/L			9668	8836	1	KED
|	**Cd**	**111**	**0.001**	ug/L	0.010	685	7	7	32	KED
⌊	**Cd**	**114**	**0.000**	ug/L	0.006	2634	6	6	65	KED
⌈>	**Tb**	**159**		ug/L			105208	97007	0	Standard
⌊	**Pb**	**208**	**-0.002**	ug/L	0.000	25	164	95	14	Standard

ICP-MS Quantitative Analysis - Summary Report

Sample ID: DI
Sample Dil Factor:
Comments:
Sample Date/Time: Saturday, July 15, 2023 02:39:42
Number of Replicates: 3
Method File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Method\200.8_DailyMethod_KED_UCT.mth
Tuning File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\MassCal\Default.tun
Optimization File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Conditions\Default.dac
Calibration File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\System\071423_A.cal

	Analyte	Mass	Conc. Mean	Units	Conc. SD	Conc. RSD	Blank Intens.	Meas. Intens.	Intens. RSD	Mode
	C	**13**		ug/L			25006	24675	3	Standard
>	**Sc**	**45**		ug/L			528830	477058	1	Standard
	Cr	**52**	**0.019**	ug/L	0.025	130	15942	14693	1	Standard
	Cr	**53**	**-0.001**	ug/L	0.002	168	99	87	3	Standard
>	**Ge**	**72**		ug/L			43452	41565	1	KED
	Ni	**60**	**-0.008**	ug/L	0.003	33	21	8	44	KED
	Ni	**62**	**-0.015**	ug/L	0.005	30	5	1	86	KED
	Cu	**63**	**-0.009**	ug/L	0.004	42	67	26	61	KED
	Cu	**65**	**-0.012**	ug/L	0.002	16	43	14	30	KED
	Zn	**66**	**-0.072**	ug/L	0.005	6	101	57	5	KED
	Zn	**67**	**-0.026**	ug/L	0.033	125	16	13	24	KED
	As	**75**	**0.002**	ug/L	0.001	67	4	4	10	KED
	Kr	**83**		ug/L			51	34	8	Standard
>	**In-1**	**115**		ug/L			9668	8931	3	KED
	Cd	**111**	**-0.000**	ug/L	0.011	3503	7	6	41	KED
	Cd	**114**	**0.004**	ug/L	0.007	195	6	8	56	KED
>	**Tb**	**159**		ug/L			105208	96014	0	Standard
	Pb	**208**	**-0.002**	ug/L	0.000	7	164	69	8	Standard

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Control Limt: +/- 10.00%
Sequence: SLG0175

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SLG0175-ICV1	Arsenic-75a	50.000	48.7	97.3	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	51.2	102	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	51.6	103	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	52.2	104	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	53.0	106	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	51.1	102	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	49.0	97.9	ug/L	PA 6020B UCT-KE
SLG0175-CCV1	Arsenic-75a	50.000	49.5	99.0	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	51.6	103	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	50.7	101	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	49.6	99.2	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	50.1	100	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.1	98.3	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.8	97.6	ug/L	PA 6020B UCT-KE
SLG0175-CCV2	Arsenic-75a	50.000	48.8	97.5	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	51.5	103	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	50.9	102	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	50.2	100	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	49.5	98.9	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.9	99.7	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	49.7	99.5	ug/L	PA 6020B UCT-KE
SLG0175-CCV3	Arsenic-75a	50.000	49.6	99.2	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	50.0	100	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	50.1	100	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	49.5	99.1	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	49.5	99.1	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.9	99.8	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	49.2	98.5	ug/L	PA 6020B UCT-KE
SLG0175-CCV4	Cadmium-111	50.000	51.1	102	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	50.7	101	ug/L	PA 6020B UCT-KE
SLG0175-CCV5	Cadmium-111	50.000	49.8	99.6	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	49.7	99.4	ug/L	PA 6020B UCT-KE
SLG0175-CCV6	Arsenic-75a	50.000	49.3	98.6	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.3	98.7	ug/L	PA 6020B UCT-KE

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Control Limt: +/- 10.00%
Sequence: SLG0175

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SLG0175-CCV6	Cadmium-114	50.000	50.0	100	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	48.3	96.6	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	48.6	97.2	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.6	99.1	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.1	96.2	ug/L	PA 6020B UCT-KE
SLG0175-CCV7	Arsenic-75a	50.000	48.9	97.8	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.4	98.8	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	50.0	99.9	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	47.7	95.4	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	49.5	99.0	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.1	98.1	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.1	96.2	ug/L	PA 6020B UCT-KE
SLG0175-CCV8	Arsenic-75a	50.000	48.7	97.3	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.4	98.8	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	49.6	99.2	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	48.1	96.3	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	48.0	96.0	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	48.2	96.3	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.0	95.9	ug/L	PA 6020B UCT-KE
SLG0175-CCV9	Arsenic-75a	50.000	47.7	95.4	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	48.9	97.9	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	48.1	96.2	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	45.9	91.8	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	46.1	92.1	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	47.4	94.8	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	47.3	94.6	ug/L	PA 6020B UCT-KE
SLG0175-CCVA	Arsenic-75a	50.000	49.3	98.5	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	50.0	100	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	49.4	98.9	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	49.2	98.3	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	49.5	99.0	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	50.1	100	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.5	96.9	ug/L	PA 6020B UCT-KE
SLG0175-CCVB	Arsenic-75a	50.000	48.7	97.4	ug/L	PA 6020B UCT-KE

Analytical Resources, LLC
Analytical Chemists and Consultants

INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Control Limt: +/- 10.00%
Sequence: SLG0175

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SLG0175-CCVB	Cadmium-111	50.000	49.4	98.8	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	49.2	98.4	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	47.7	95.5	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	47.9	95.8	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	48.6	97.2	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	48.4	96.8	ug/L	PA 6020B UCT-KE
SLG0175-CCVC	Arsenic-75a	50.000	48.0	95.9	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.1	98.2	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	48.5	97.0	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	47.3	94.7	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	47.8	95.6	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	48.2	96.4	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	46.4	92.9	ug/L	PA 6020B UCT-KE
SLG0175-CCVD	Arsenic-75a	50.000	48.9	97.7	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.6	99.1	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	47.8	95.6	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	47.4	94.8	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	48.0	96.0	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	49.0	97.9	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	49.0	98.1	ug/L	PA 6020B UCT-KE
SLG0175-CCVE	Arsenic-75a	50.000	48.9	97.8	ug/L	PA 6020B UCT-KE
	Cadmium-111	50.000	49.0	98.1	ug/L	PA 6020B UCT-KE
	Cadmium-114	50.000	48.3	96.5	ug/L	PA 6020B UCT-KE
	Copper-63	50.000	46.7	93.4	ug/L	PA 6020B UCT-KE
	Copper-65	50.000	46.6	93.2	ug/L	PA 6020B UCT-KE
	Zinc-66	50.000	48.5	97.1	ug/L	PA 6020B UCT-KE
	Zinc-67	50.000	47.4	94.8	ug/L	PA 6020B UCT-KE

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/14/23 15:41

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-IBL1	Arsenic-75a	0.00900	0.0373	0.200	ug/L	
SLG0175-IBL1	Cadmium-111	0.0100	0.03	0.100	ug/L	
SLG0175-IBL1	Cadmium-114	0.00100	0.04	0.100	ug/L	
SLG0175-IBL1	Copper-63	0.00	0.173	0.500	ug/L	
SLG0175-IBL1	Copper-65	0.00400	0.35	0.500	ug/L	
SLG0175-IBL1	Zinc-66	0.0060	2.92	6.00	ug/L	
SLG0175-IBL1	Zinc-67	0.0700	0.94	6.00	ug/L	
SLG0175-ICB1	Arsenic-75a	-0.00400	0.0373	0.200	ug/L	
SLG0175-ICB1	Cadmium-111	0.00300	0.03	0.100	ug/L	
SLG0175-ICB1	Cadmium-114	0.00200	0.04	0.100	ug/L	
SLG0175-ICB1	Copper-63	0.00	0.173	0.500	ug/L	
SLG0175-ICB1	Copper-65	0.00700	0.35	0.500	ug/L	
SLG0175-ICB1	Zinc-66	-0.0080	2.92	6.00	ug/L	
SLG0175-ICB1	Zinc-67	0.0060	0.94	6.00	ug/L	
SLG0175-CCB1	Arsenic-75a	0.00100	0.0373	0.200	ug/L	
SLG0175-CCB1	Cadmium-111	0.00900	0.03	0.100	ug/L	
SLG0175-CCB1	Cadmium-114	-0.00300	0.04	0.100	ug/L	
SLG0175-CCB1	Copper-63	0.00	0.173	0.500	ug/L	
SLG0175-CCB1	Copper-65	0.00600	0.35	0.500	ug/L	
SLG0175-CCB1	Zinc-66	0.0010	2.92	6.00	ug/L	
SLG0175-CCB1	Zinc-67	-0.0770	0.94	6.00	ug/L	
SLG0175-IBL2	Arsenic-75a	0.0170	0.0373	0.200	ug/L	
SLG0175-IBL2	Cadmium-111	0.00700	0.03	0.100	ug/L	
SLG0175-IBL2	Cadmium-114	0.00300	0.04	0.100	ug/L	
SLG0175-IBL2	Copper-63	0.00700	0.173	0.500	ug/L	
SLG0175-IBL2	Copper-65	0.0100	0.35	0.500	ug/L	
SLG0175-IBL2	Zinc-66	-0.0160	2.92	6.00	ug/L	
SLG0175-IBL2	Zinc-67	0.0140	0.94	6.00	ug/L	
SLG0175-IBL3	Arsenic-75a	0.00400	0.0373	0.200	ug/L	
SLG0175-IBL3	Cadmium-111	0.0100	0.03	0.100	ug/L	
SLG0175-IBL3	Cadmium-114	0.00	0.04	0.100	ug/L	
SLG0175-IBL3	Copper-63	0.00200	0.173	0.500	ug/L	
SLG0175-IBL3	Copper-65	0.00	0.35	0.500	ug/L	
SLG0175-IBL3	Zinc-66	0.0070	2.92	6.00	ug/L	
SLG0175-IBL3	Zinc-67	0.0030	0.94	6.00	ug/L	

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/14/23 17:10

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-CCB2	Arsenic-75a	0.00700	0.0373	0.200	ug/L	
SLG0175-CCB2	Cadmium-111	0.00500	0.03	0.100	ug/L	
SLG0175-CCB2	Cadmium-114	-0.00100	0.04	0.100	ug/L	
SLG0175-CCB2	Copper-63	0.00300	0.173	0.500	ug/L	
SLG0175-CCB2	Copper-65	0.00800	0.35	0.500	ug/L	
SLG0175-CCB2	Zinc-66	-0.0090	2.92	6.00	ug/L	
SLG0175-CCB2	Zinc-67	-0.0110	0.94	6.00	ug/L	
SLG0175-IBL4	Arsenic-75a	0.00100	0.0373	0.200	ug/L	
SLG0175-IBL4	Cadmium-111	0.00800	0.03	0.100	ug/L	
SLG0175-IBL4	Cadmium-114	0.00500	0.04	0.100	ug/L	
SLG0175-IBL4	Copper-63	0.00800	0.173	0.500	ug/L	
SLG0175-IBL4	Copper-65	0.00900	0.35	0.500	ug/L	
SLG0175-IBL4	Zinc-66	0.0410	2.92	6.00	ug/L	
SLG0175-IBL4	Zinc-67	0.0200	0.94	6.00	ug/L	
SLG0175-CCB3	Arsenic-75a	0.00700	0.0373	0.200	ug/L	
SLG0175-CCB3	Cadmium-111	0.0140	0.03	0.100	ug/L	
SLG0175-CCB3	Cadmium-114	0.00400	0.04	0.100	ug/L	
SLG0175-CCB3	Copper-63	0.00400	0.173	0.500	ug/L	
SLG0175-CCB3	Copper-65	0.00700	0.35	0.500	ug/L	
SLG0175-CCB3	Zinc-66	-0.0170	2.92	6.00	ug/L	
SLG0175-CCB3	Zinc-67	-0.0170	0.94	6.00	ug/L	
SLG0175-IBL5	Cadmium-111	0.0140	0.03	0.100	ug/L	
SLG0175-IBL5	Cadmium-114	-0.00100	0.04	0.100	ug/L	
SLG0175-CCB4	Cadmium-111	0.0160	0.03	0.100	ug/L	
SLG0175-CCB4	Cadmium-114	0.00	0.04	0.100	ug/L	
SLG0175-IBL6	Cadmium-111	0.0160	0.03	0.100	ug/L	
SLG0175-IBL6	Cadmium-114	0.00300	0.04	0.100	ug/L	
SLG0175-IBL7	Cadmium-111	0.0160	0.03	0.100	ug/L	
SLG0175-IBL7	Cadmium-114	0.00100	0.04	0.100	ug/L	
SLG0175-CCB5	Cadmium-111	0.0110	0.03	0.100	ug/L	
SLG0175-CCB5	Cadmium-114	0.00200	0.04	0.100	ug/L	
SLG0175-CCB6	Arsenic-75a	0.0160	0.0373	0.200	ug/L	
SLG0175-CCB6	Cadmium-111	0.0140	0.03	0.100	ug/L	
SLG0175-CCB6	Cadmium-114	0.00200	0.04	0.100	ug/L	
SLG0175-CCB6	Copper-63	0.0210	0.173	0.500	ug/L	
SLG0175-CCB6	Copper-65	0.0260	0.35	0.500	ug/L	

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/14/23 19:34

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-CCB6	Zinc-66	0.0290	2.92	6.00	ug/L	
SLG0175-CCB6	Zinc-67	0.0790	0.94	6.00	ug/L	
SLG0175-IBL8	Arsenic-75a	0.0100	0.0373	0.200	ug/L	
SLG0175-IBL8	Cadmium-111	0.00600	0.03	0.100	ug/L	
SLG0175-IBL8	Cadmium-114	0.00700	0.04	0.100	ug/L	
SLG0175-IBL8	Copper-63	0.00600	0.173	0.500	ug/L	
SLG0175-IBL8	Copper-65	0.0120	0.35	0.500	ug/L	
SLG0175-IBL8	Zinc-66	-0.0010	2.92	6.00	ug/L	
SLG0175-IBL8	Zinc-67	0.0400	0.94	6.00	ug/L	
SLG0175-CCB7	Arsenic-75a	0.00500	0.0373	0.200	ug/L	
SLG0175-CCB7	Cadmium-111	0.00800	0.03	0.100	ug/L	
SLG0175-CCB7	Cadmium-114	0.00300	0.04	0.100	ug/L	
SLG0175-CCB7	Copper-63	0.00500	0.173	0.500	ug/L	
SLG0175-CCB7	Copper-65	0.00600	0.35	0.500	ug/L	
SLG0175-CCB7	Zinc-66	0.0310	2.92	6.00	ug/L	
SLG0175-CCB7	Zinc-67	0.0530	0.94	6.00	ug/L	
SLG0175-IBL9	Arsenic-75a	0.00900	0.0373	0.200	ug/L	
SLG0175-IBL9	Cadmium-111	0.00900	0.03	0.100	ug/L	
SLG0175-IBL9	Cadmium-114	0.00700	0.04	0.100	ug/L	
SLG0175-IBL9	Copper-63	0.0660	0.173	0.500	ug/L	
SLG0175-IBL9	Copper-65	0.0770	0.35	0.500	ug/L	
SLG0175-IBL9	Zinc-66	0.112	2.92	6.00	ug/L	
SLG0175-IBL9	Zinc-67	0.138	0.94	6.00	ug/L	
SLG0175-CCB8	Arsenic-75a	0.0390	0.0373	0.200	ug/L	
SLG0175-CCB8	Cadmium-111	0.00600	0.03	0.100	ug/L	
SLG0175-CCB8	Cadmium-114	0.00400	0.04	0.100	ug/L	
SLG0175-CCB8	Copper-63	0.0620	0.173	0.500	ug/L	
SLG0175-CCB8	Copper-65	0.0640	0.35	0.500	ug/L	
SLG0175-CCB8	Zinc-66	0.0590	2.92	6.00	ug/L	
SLG0175-CCB8	Zinc-67	0.0940	0.94	6.00	ug/L	
SLG0175-IBLA	Arsenic-75a	0.00400	0.0373	0.200	ug/L	
SLG0175-IBLA	Cadmium-111	0.00800	0.03	0.100	ug/L	
SLG0175-IBLA	Cadmium-114	0.00200	0.04	0.100	ug/L	
SLG0175-IBLA	Copper-63	0.0320	0.173	0.500	ug/L	
SLG0175-IBLA	Copper-65	0.0310	0.35	0.500	ug/L	
SLG0175-IBLA	Zinc-66	0.0680	2.92	6.00	ug/L	

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/14/23 22:06

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-IBLA	Zinc-67	0.114	0.94	6.00	ug/L	
SLG0175-CCB9	Arsenic-75a	0.00300	0.0373	0.200	ug/L	
SLG0175-CCB9	Cadmium-111	0.00800	0.03	0.100	ug/L	
SLG0175-CCB9	Cadmium-114	0.00600	0.04	0.100	ug/L	
SLG0175-CCB9	Copper-63	0.00700	0.173	0.500	ug/L	
SLG0175-CCB9	Copper-65	0.00700	0.35	0.500	ug/L	
SLG0175-CCB9	Zinc-66	0.0020	2.92	6.00	ug/L	
SLG0175-CCB9	Zinc-67	0.0060	0.94	6.00	ug/L	
SLG0175-IBLB	Arsenic-75a	0.00	0.0373	0.200	ug/L	
SLG0175-IBLB	Cadmium-111	0.0110	0.03	0.100	ug/L	
SLG0175-IBLB	Cadmium-114	0.00500	0.04	0.100	ug/L	
SLG0175-IBLB	Copper-63	0.00300	0.173	0.500	ug/L	
SLG0175-IBLB	Copper-65	0.00800	0.35	0.500	ug/L	
SLG0175-IBLB	Zinc-66	-0.0150	2.92	6.00	ug/L	
SLG0175-IBLB	Zinc-67	0.0250	0.94	6.00	ug/L	
SLG0175-CCBA	Arsenic-75a	-0.00100	0.0373	0.200	ug/L	
SLG0175-CCBA	Cadmium-111	0.00700	0.03	0.100	ug/L	
SLG0175-CCBA	Cadmium-114	0.00800	0.04	0.100	ug/L	
SLG0175-CCBA	Copper-63	0.00300	0.173	0.500	ug/L	
SLG0175-CCBA	Copper-65	0.00600	0.35	0.500	ug/L	
SLG0175-CCBA	Zinc-66	0.0170	2.92	6.00	ug/L	
SLG0175-CCBA	Zinc-67	0.0580	0.94	6.00	ug/L	
SLG0175-CCBB	Arsenic-75a	0.00100	0.0373	0.200	ug/L	
SLG0175-CCBB	Cadmium-111	-0.00600	0.03	0.100	ug/L	
SLG0175-CCBB	Cadmium-114	0.00	0.04	0.100	ug/L	
SLG0175-CCBB	Copper-63	0.00	0.173	0.500	ug/L	
SLG0175-CCBB	Copper-65	0.00100	0.35	0.500	ug/L	
SLG0175-CCBB	Zinc-66	-0.0140	2.92	6.00	ug/L	
SLG0175-CCBB	Zinc-67	0.0140	0.94	6.00	ug/L	
SLG0175-IBLC	Arsenic-75a	0.00100	0.0373	0.200	ug/L	
SLG0175-IBLC	Cadmium-111	-0.0100	0.03	0.100	ug/L	
SLG0175-IBLC	Cadmium-114	0.00300	0.04	0.100	ug/L	
SLG0175-IBLC	Copper-63	-0.00200	0.173	0.500	ug/L	
SLG0175-IBLC	Copper-65	-0.00400	0.35	0.500	ug/L	
SLG0175-IBLC	Zinc-66	-0.0380	2.92	6.00	ug/L	
SLG0175-IBLC	Zinc-67	-0.0480	0.94	6.00	ug/L	

Analytical Resources, LLC
Analytical Chemists and Consultants

INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/15/23 00:23

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-CCBC	Arsenic-75a	0.00300	0.0373	0.200	ug/L	
SLG0175-CCBC	Cadmium-111	0.00	0.03	0.100	ug/L	
SLG0175-CCBC	Cadmium-114	-0.00500	0.04	0.100	ug/L	
SLG0175-CCBC	Copper-63	-0.00600	0.173	0.500	ug/L	
SLG0175-CCBC	Copper-65	-0.00500	0.35	0.500	ug/L	
SLG0175-CCBC	Zinc-66	-0.0270	2.92	6.00	ug/L	
SLG0175-CCBC	Zinc-67	0.0340	0.94	6.00	ug/L	
SLG0175-IBLD	Arsenic-75a	-0.00500	0.0373	0.200	ug/L	
SLG0175-IBLD	Cadmium-111	0.00500	0.03	0.100	ug/L	
SLG0175-IBLD	Cadmium-114	0.00400	0.04	0.100	ug/L	
SLG0175-IBLD	Copper-63	-0.00100	0.173	0.500	ug/L	
SLG0175-IBLD	Copper-65	-0.00400	0.35	0.500	ug/L	
SLG0175-IBLD	Zinc-66	-0.0420	2.92	6.00	ug/L	
SLG0175-IBLD	Zinc-67	-0.0600	0.94	6.00	ug/L	
SLG0175-IBLE	Arsenic-75a	0.00400	0.0373	0.200	ug/L	
SLG0175-IBLE	Cadmium-111	0.00100	0.03	0.100	ug/L	
SLG0175-IBLE	Cadmium-114	-0.00600	0.04	0.100	ug/L	
SLG0175-IBLE	Copper-63	0.0120	0.173	0.500	ug/L	
SLG0175-IBLE	Copper-65	0.00500	0.35	0.500	ug/L	
SLG0175-IBLE	Zinc-66	-0.0750	2.92	6.00	ug/L	
SLG0175-IBLE	Zinc-67	-0.0240	0.94	6.00	ug/L	
SLG0175-CCBD	Arsenic-75a	0.00700	0.0373	0.200	ug/L	
SLG0175-CCBD	Cadmium-111	-0.00200	0.03	0.100	ug/L	
SLG0175-CCBD	Cadmium-114	0.00200	0.04	0.100	ug/L	
SLG0175-CCBD	Copper-63	-0.00200	0.173	0.500	ug/L	
SLG0175-CCBD	Copper-65	-0.00600	0.35	0.500	ug/L	
SLG0175-CCBD	Zinc-66	-0.0380	2.92	6.00	ug/L	
SLG0175-CCBD	Zinc-67	0.0200	0.94	6.00	ug/L	
SLG0175-IBLF	Arsenic-75a	0.00900	0.0373	0.200	ug/L	
SLG0175-IBLF	Cadmium-111	-0.00800	0.03	0.100	ug/L	
SLG0175-IBLF	Cadmium-114	-0.00100	0.04	0.100	ug/L	
SLG0175-IBLF	Copper-63	0.0210	0.173	0.500	ug/L	
SLG0175-IBLF	Copper-65	0.0120	0.35	0.500	ug/L	
SLG0175-IBLF	Zinc-66	-0.0500	2.92	6.00	ug/L	
SLG0175-IBLF	Zinc-67	0.0050	0.94	6.00	ug/L	
SLG0175-IBLG	Arsenic-75a	0.00300	0.0373	0.200	ug/L	

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INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
Client: HydroGeoLogic, Inc.
Instrument ID: ICPMS1
Sequence: SLG0175

SDG: 23F0627
Project: Portland Harbor Superfund Site 2021-2
Calibration: GG00039
Date Analyzed: 07/15/23 01:49

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SLG0175-IBLG	Cadmium-111	-0.00200	0.03	0.100	ug/L	
SLG0175-IBLG	Cadmium-114	-0.00100	0.04	0.100	ug/L	
SLG0175-IBLG	Copper-63	0.00700	0.173	0.500	ug/L	
SLG0175-IBLG	Copper-65	0.00200	0.35	0.500	ug/L	
SLG0175-IBLG	Zinc-66	-0.0920	2.92	6.00	ug/L	
SLG0175-IBLG	Zinc-67	-0.108	0.94	6.00	ug/L	
SLG0175-IBLH	Arsenic-75a	0.00200	0.0373	0.200	ug/L	
SLG0175-IBLH	Cadmium-111	-0.0130	0.03	0.100	ug/L	
SLG0175-IBLH	Cadmium-114	0.00100	0.04	0.100	ug/L	
SLG0175-IBLH	Copper-63	0.00300	0.173	0.500	ug/L	
SLG0175-IBLH	Copper-65	0.0100	0.35	0.500	ug/L	
SLG0175-IBLH	Zinc-66	-0.0970	2.92	6.00	ug/L	
SLG0175-IBLH	Zinc-67	-0.0880	0.94	6.00	ug/L	
SLG0175-CCBE	Arsenic-75a	0.00500	0.0373	0.200	ug/L	
SLG0175-CCBE	Cadmium-111	-0.00200	0.03	0.100	ug/L	
SLG0175-CCBE	Cadmium-114	0.00	0.04	0.100	ug/L	
SLG0175-CCBE	Copper-63	0.00	0.173	0.500	ug/L	
SLG0175-CCBE	Copper-65	-0.00800	0.35	0.500	ug/L	
SLG0175-CCBE	Zinc-66	-0.0140	2.92	6.00	ug/L	
SLG0175-CCBE	Zinc-67	-0.0290	0.94	6.00	ug/L	

Analytical Resources, LLC
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ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SLG0175-CAL1	XDT_m1230714-006	NA	07/14/23 15:09
CAL 1 - LOW CHECK	SLG0175-CAL2	XDT_m1230714-007	NA	07/14/23 15:13
CAL 2	SLG0175-CAL3	XDT_m1230714-008	NA	07/14/23 15:18
CAL 3	SLG0175-CAL4	XDT_m1230714-009	NA	07/14/23 15:22
CAL 4	SLG0175-CAL5	XDT_m1230714-010	NA	07/14/23 15:27
CAL 5	SLG0175-CAL6	XDT_m1230714-011	NA	07/14/23 15:33
RINSE	SLG0175-IBL1	XDT_m1230714-012	NA	07/14/23 15:41
Initial Cal Check	SLG0175-ICV1	XDT_m1230714-014	NA	07/14/23 15:47
Initial Cal Blank	SLG0175-ICB1	XDT_m1230714-016	NA	07/14/23 16:00
Calibration Check	SLG0175-CCV1	XDT_m1230714-017	NA	07/14/23 16:04
Calibration Blank	SLG0175-CCB1	XDT_m1230714-019	NA	07/14/23 16:17
Instrument RL Check	SLG0175-CRL1	XDT_m1230714-020	NA	07/14/23 16:21
Interference Check B	SLG0175-IFB1	XDT_m1230714-022	NA	07/14/23 16:31
LR200	SLG0175-HCV1	XDT_m1230714-023	NA	07/14/23 16:35
LR300	SLG0175-HCV2	XDT_m1230714-024	NA	07/14/23 16:40
Instrument Blank	SLG0175-IBL2	XDT_m1230714-025	NA	07/14/23 16:47
Interference Check A	SLG0175-IFA1	XDT_m1230714-026	NA	07/14/23 16:53
Instrument Blank	SLG0175-IBL3	XDT_m1230714-027	NA	07/14/23 16:57
Calibration Check	SLG0175-CCV2	XDT_m1230714-028	NA	07/14/23 17:03
Calibration Blank	SLG0175-CCB2	XDT_m1230714-029	NA	07/14/23 17:10
Instrument Blank	SLG0175-IBL4	XDT_m1230714-036	NA	07/14/23 17:44
Calibration Check	SLG0175-CCV3	XDT_m1230714-037	NA	07/14/23 17:48
Calibration Blank	SLG0175-CCB3	XDT_m1230714-038	NA	07/14/23 17:56
ZZZZZ	BLG0243-BLK1	XDT_m1230714-039	Water	07/14/23 18:01
ZZZZZ	BLG0243-BS1	XDT_m1230714-040	Water	07/14/23 18:05
ZZZZZ	BLG0243-BSD1	XDT_m1230714-041	Water	07/14/23 18:08
ZZZZZ	23F0286-05RE1	XDT_m1230714-042	Water	07/14/23 18:12
ZZZZZ	23F0286-11RE1	XDT_m1230714-043	Water	07/14/23 18:15
ZZZZZ	23F0365-06RE1	XDT_m1230714-044	Water	07/14/23 18:19

Analytical Resources, LLC
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ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	23F0365-08RE1	XDT_m1230714-045	Water	07/14/23 18:22
ZZZZZ	23F0365-09RE1	XDT_m1230714-046	Water	07/14/23 18:26
ZZZZZ	23F0365-11RE1	XDT_m1230714-047	Water	07/14/23 18:29
Instrument Blank	SLG0175-IBL5	XDT_m1230714-048	NA	07/14/23 18:33
Calibration Check	SLG0175-CCV4	XDT_m1230714-049	NA	07/14/23 18:36
Calibration Blank	SLG0175-CCB4	XDT_m1230714-051	NA	07/14/23 18:47
ZZZZZ	23F0286-02RE1	XDT_m1230714-052	Water	07/14/23 18:50
ZZZZZ	BLG0243-DUP1	XDT_m1230714-053	Water	07/14/23 18:54
ZZZZZ	BLG0243-MS1	XDT_m1230714-054	Water	07/14/23 18:57
Instrument Blank	SLG0175-IBL6	XDT_m1230714-055	NA	07/14/23 19:02
ZZZZZ	23F0364-59	XDT_m1230714-056	Water	07/14/23 19:05
Instrument Blank	SLG0175-IBL7	XDT_m1230714-057	NA	07/14/23 19:08
Calibration Check	SLG0175-CCV5	XDT_m1230714-058	NA	07/14/23 19:12
Calibration Blank	SLG0175-CCB5	XDT_m1230714-059	NA	07/14/23 19:18
Calibration Check	SLG0175-CCV6	XDT_m1230714-061	NA	07/14/23 19:27
Calibration Blank	SLG0175-CCB6	XDT_m1230714-062	NA	07/14/23 19:34
Blank	BLG0203-BLK1	XDT_m1230714-063	Solid	07/14/23 19:38
LCS	BLG0203-BS1	XDT_m1230714-064	Solid	07/14/23 19:42
Reference	BLG0203-SRM1	XDT_m1230714-071	Solid	07/14/23 20:12
Instrument Blank	SLG0175-IBL8	XDT_m1230714-072	NA	07/14/23 20:17
Calibration Check	SLG0175-CCV7	XDT_m1230714-073	NA	07/14/23 20:21
Calibration Blank	SLG0175-CCB7	XDT_m1230714-074	NA	07/14/23 20:28
ZZZZZ	23F0303-02	XDT_m1230714-075	Solid	07/14/23 20:32
ZZZZZ	23F0303-02	XDT_m1230714-075	Solid	07/14/23 20:32
ZZZZZ	23F0303-02	XDT_m1230714-075	Solid	07/14/23 20:32
ZZZZZ	23F0303-02	XDT_m1230714-075	Solid	07/14/23 20:32
ZZZZZ	23F0303-03	XDT_m1230714-076	Solid	07/14/23 20:37
ZZZZZ	23F0303-03	XDT_m1230714-076	Solid	07/14/23 20:37
ZZZZZ	23F0303-03	XDT_m1230714-076	Solid	07/14/23 20:37

Analytical Resources, LLC
Analytical Chemists and Consultants

ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	23F0303-03	XDT_m1230714-076	Solid	07/14/23 20:37
ZZZZZ	23F0303-04	XDT_m1230714-077	Solid	07/14/23 20:41
ZZZZZ	23F0303-04	XDT_m1230714-077	Solid	07/14/23 20:41
ZZZZZ	23F0303-05	XDT_m1230714-078	Solid	07/14/23 20:45
ZZZZZ	23F0303-05	XDT_m1230714-078	Solid	07/14/23 20:45
ZZZZZ	23F0303-05	XDT_m1230714-078	Solid	07/14/23 20:45
ZZZZZ	23F0303-05	XDT_m1230714-078	Solid	07/14/23 20:45
ZZZZZ	23F0303-06	XDT_m1230714-079	Solid	07/14/23 20:50
ZZZZZ	23F0303-06	XDT_m1230714-079	Solid	07/14/23 20:50
ZZZZZ	23F0303-06	XDT_m1230714-079	Solid	07/14/23 20:50
ZZZZZ	23F0303-06	XDT_m1230714-079	Solid	07/14/23 20:50
ZZZZZ	23F0303-07	XDT_m1230714-080	Solid	07/14/23 20:54
ZZZZZ	23F0303-07	XDT_m1230714-080	Solid	07/14/23 20:54
ZZZZZ	23F0303-07	XDT_m1230714-080	Solid	07/14/23 20:54
ZZZZZ	23F0303-07	XDT_m1230714-080	Solid	07/14/23 20:54
ZZZZZ	23F0303-08	XDT_m1230714-081	Solid	07/14/23 20:58
ZZZZZ	23F0303-08	XDT_m1230714-081	Solid	07/14/23 20:58
ZZZZZ	23F0303-08	XDT_m1230714-081	Solid	07/14/23 20:58
ZZZZZ	23F0303-08	XDT_m1230714-081	Solid	07/14/23 20:58
ZZZZZ	23F0303-09	XDT_m1230714-082	Solid	07/14/23 21:03
ZZZZZ	23F0303-09	XDT_m1230714-082	Solid	07/14/23 21:03
ZZZZZ	23F0303-09	XDT_m1230714-082	Solid	07/14/23 21:03
ZZZZZ	23F0303-09	XDT_m1230714-082	Solid	07/14/23 21:03
ZZZZZ	23F0303-10	XDT_m1230714-083	Solid	07/14/23 21:07
ZZZZZ	23F0303-10	XDT_m1230714-083	Solid	07/14/23 21:07
ZZZZZ	23F0303-10	XDT_m1230714-083	Solid	07/14/23 21:07
ZZZZZ	23F0303-10	XDT_m1230714-083	Solid	07/14/23 21:07
Instrument Blank	SLG0175-IBL9	XDT_m1230714-084	NA	07/14/23 21:11
Calibration Check	SLG0175-CCV8	XDT_m1230714-085	NA	07/14/23 21:16

Analytical Resources, LLC
Analytical Chemists and Consultants

ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Blank	SLG0175-CCB8	XDT_m1230714-086	NA	07/14/23 21:23
ZZZZZ	23F0303-11	XDT_m1230714-087	Solid	07/14/23 21:27
ZZZZZ	23F0303-11	XDT_m1230714-087	Solid	07/14/23 21:27
ZZZZZ	23F0303-11	XDT_m1230714-087	Solid	07/14/23 21:27
ZZZZZ	23F0303-11	XDT_m1230714-087	Solid	07/14/23 21:27
ZZZZZ	23F0303-12	XDT_m1230714-088	Solid	07/14/23 21:31
ZZZZZ	23F0303-12	XDT_m1230714-088	Solid	07/14/23 21:31
ZZZZZ	23F0303-12	XDT_m1230714-088	Solid	07/14/23 21:31
ZZZZZ	23F0303-12	XDT_m1230714-088	Solid	07/14/23 21:31
ZZZZZ	23F0303-13	XDT_m1230714-089	Solid	07/14/23 21:36
ZZZZZ	23F0303-13	XDT_m1230714-089	Solid	07/14/23 21:36
ZZZZZ	23F0303-13	XDT_m1230714-089	Solid	07/14/23 21:36
ZZZZZ	23F0303-13	XDT_m1230714-089	Solid	07/14/23 21:36
ZZZZZ	23F0303-14	XDT_m1230714-090	Solid	07/14/23 21:40
ZZZZZ	23F0303-14	XDT_m1230714-090	Solid	07/14/23 21:40
ZZZZZ	23F0303-14	XDT_m1230714-090	Solid	07/14/23 21:40
ZZZZZ	23F0303-14	XDT_m1230714-090	Solid	07/14/23 21:40
ZZZZZ	23F0303-15	XDT_m1230714-091	Solid	07/14/23 21:44
ZZZZZ	23F0303-15	XDT_m1230714-091	Solid	07/14/23 21:44
ZZZZZ	23F0303-15	XDT_m1230714-091	Solid	07/14/23 21:44
ZZZZZ	23F0303-15	XDT_m1230714-091	Solid	07/14/23 21:44
ZZZZZ	23F0303-16	XDT_m1230714-092	Solid	07/14/23 21:49
ZZZZZ	23F0303-16	XDT_m1230714-092	Solid	07/14/23 21:49
ZZZZZ	23F0303-16	XDT_m1230714-092	Solid	07/14/23 21:49
ZZZZZ	23F0303-16	XDT_m1230714-092	Solid	07/14/23 21:49
ZZZZZ	23F0303-17	XDT_m1230714-093	Solid	07/14/23 21:53
ZZZZZ	23F0303-17	XDT_m1230714-093	Solid	07/14/23 21:53
ZZZZZ	23F0303-17	XDT_m1230714-093	Solid	07/14/23 21:53
ZZZZZ	23F0303-17	XDT_m1230714-093	Solid	07/14/23 21:53

Analytical Resources, LLC
Analytical Chemists and Consultants

ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	23F0303-18	XDT_m1230714-094	Solid	07/14/23 21:57
ZZZZZ	23F0303-18	XDT_m1230714-094	Solid	07/14/23 21:57
ZZZZZ	23F0303-18	XDT_m1230714-094	Solid	07/14/23 21:57
ZZZZZ	23F0303-18	XDT_m1230714-094	Solid	07/14/23 21:57
ZZZZZ	23F0303-19	XDT_m1230714-095	Solid	07/14/23 22:01
Instrument Blank	SLG0175-IBLA	XDT_m1230714-096	NA	07/14/23 22:06
Calibration Check	SLG0175-CCV9	XDT_m1230714-097	NA	07/14/23 22:10
Calibration Blank	SLG0175-CCB9	XDT_m1230714-098	NA	07/14/23 22:17
ZZZZZ	23F0365-10	XDT_m1230714-101	Water	07/14/23 22:30
ZZZZZ	23F0365-21	XDT_m1230714-105	Water	07/14/23 22:47
ZZZZZ	23F0365-21	XDT_m1230714-105	Water	07/14/23 22:47
ZZZZZ	23F0365-39	XDT_m1230714-106	Water	07/14/23 22:52
ZZZZZ	23F0365-39	XDT_m1230714-106	Water	07/14/23 22:52
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	Solid	07/14/23 22:56
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	Solid	07/14/23 22:56
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	Solid	07/14/23 22:56
SIB-SED-MG-AAM169-NW-06172	23F0627-01	XDT_m1230714-107	Solid	07/14/23 22:56
Instrument Blank	SLG0175-IBLB	XDT_m1230714-108	NA	07/14/23 23:01
Calibration Check	SLG0175-CCVA	XDT_m1230714-109	NA	07/14/23 23:05
Calibration Blank	SLG0175-CCBA	XDT_m1230714-110	NA	07/14/23 23:12
Calibration Check	SLG0175-CCVB	XDT_m1230714-112	NA	07/14/23 23:21
Calibration Blank	SLG0175-CCBB	XDT_m1230714-113	NA	07/14/23 23:28
ZZZZZ	23F0365-14	XDT_m1230714-114	Water	07/14/23 23:32
ZZZZZ	23F0365-14	XDT_m1230714-114	Water	07/14/23 23:32
ZZZZZ	23F0365-16	XDT_m1230714-115	Water	07/14/23 23:36
ZZZZZ	23F0365-16	XDT_m1230714-115	Water	07/14/23 23:36
ZZZZZ	23F0365-36	XDT_m1230714-116	Water	07/14/23 23:41
ZZZZZ	23F0365-36	XDT_m1230714-116	Water	07/14/23 23:41
ZZZZZ	23F0365-37	XDT_m1230714-117	Water	07/14/23 23:45

Analytical Resources, LLC
Analytical Chemists and Consultants

ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory:	Analytical Resources, LLC	SDG:	23F0627
Client:	HydroGeoLogic, Inc.	Project:	Portland Harbor Superfund Site 2021-2023
Sequence:	SLG0175	Instrument:	ICPMS1
		Calibration:	GG00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	23F0365-37	XDT_m1230714-117	Water	07/14/23 23:45
ZZZZZ	23F0365-38	XDT_m1230714-118	Water	07/14/23 23:49
ZZZZZ	23F0365-38	XDT_m1230714-118	Water	07/14/23 23:49
ZZZZZ	23F0365-40	XDT_m1230714-119	Water	07/14/23 23:54
ZZZZZ	23F0365-40	XDT_m1230714-119	Water	07/14/23 23:54
ZZZZZ	23F0365-04	XDT_m1230714-120	Water	07/14/23 23:58
ZZZZZ	23F0365-04	XDT_m1230714-120	Water	07/14/23 23:58
ZZZZZ	23F0365-04	XDT_m1230714-120	Water	07/14/23 23:58
ZZZZZ	23F0365-24	XDT_m1230714-121	Water	07/15/23 00:03
ZZZZZ	23F0365-24	XDT_m1230714-121	Water	07/15/23 00:03
ZZZZZ	23F0365-31	XDT_m1230714-122	Water	07/15/23 00:07
Instrument Blank	SLG0175-IBLC	XDT_m1230714-123	NA	07/15/23 00:11
Calibration Check	SLG0175-CCVC	XDT_m1230714-124	NA	07/15/23 00:16
Calibration Blank	SLG0175-CCBC	XDT_m1230714-125	NA	07/15/23 00:23
ZZZZZ	23F0365-18	XDT_m1230714-126	Water	07/15/23 00:27
ZZZZZ	23F0365-18	XDT_m1230714-126	Water	07/15/23 00:27
ZZZZZ	23F0365-23	XDT_m1230714-127	Water	07/15/23 00:31
ZZZZZ	23F0365-23	XDT_m1230714-127	Water	07/15/23 00:31
Instrument Blank	SLG0175-IBLD	XDT_m1230714-128	NA	07/15/23 00:35
Instrument Blank	SLG0175-IBLE	XDT_m1230714-135	NA	07/15/23 01:06
Calibration Check	SLG0175-CCVD	XDT_m1230714-136	NA	07/15/23 01:11
Calibration Blank	SLG0175-CCBD	XDT_m1230714-137	NA	07/15/23 01:18
Instrument Blank	SLG0175-IBLF	XDT_m1230714-140	NA	07/15/23 01:31
ZZZZZ	23F0496-02	XDT_m1230714-141	Water	07/15/23 01:35
Instrument Blank	SLG0175-IBLG	XDT_m1230714-144	NA	07/15/23 01:49
Instrument Blank	SLG0175-IBLH	XDT_m1230714-147	NA	07/15/23 02:02
Calibration Check	SLG0175-CCVE	XDT_m1230714-148	NA	07/15/23 02:06
Calibration Blank	SLG0175-CCBE	XDT_m1230714-149	NA	07/15/23 02:13

Analytical Resources, LLC
Analytical Chemists and Consultants

ICP INTERFERENCE CHECK SAMPLE

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Standard ID: L007219

Lab Sample ID	Analyte	True	Found	%R	Units
SLG0175-IFA1	Arsenic-75a	0	0.0360		ug/L
	Cadmium-111	0	0.0700		ug/L
	Cadmium-114	0	0.0470		ug/L
	Copper-63	0	0.0270		ug/L
	Copper-65	0	0.0350		ug/L
	Zinc-66	0	0.1630		ug/L
	Zinc-67	0	0.1910		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.

Analytical Resources, LLC
Analytical Chemists and Consultants

ICP INTERFERENCE CHECK SAMPLE

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Standard ID: L007219

Lab Sample ID	Analyte	True	Found	%R	Units
SLG0175-IFB1	Arsenic-75a	20.000	20.159	101	ug/L
	Cadmium-111	20.000	19.926	99.6	ug/L
	Cadmium-114	20.000	19.681	98.4	ug/L
	Copper-63	20.000	19.995	100	ug/L
	Copper-65	20.000	19.827	99.1	ug/L
	Zinc-66	20.000	19.066	95.3	ug/L
	Zinc-67	20.000	16.778	83.9	ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.

Analytical Resources, LLC
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DETECTION LEVEL STANDARD
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Instrument ID: ICPMS1
Calibration: GG00039
Sequence: SLG0175
Lab Sample ID: SLG0175-CRL1

Analyte	True	Found	%R	Units	QC Limts
Arsenic-75a	0.20000	0.214	107	ug/L	50 - 150
Cadmium-111	0.10000	0.101	101	ug/L	50 - 150
Cadmium-114	0.10000	0.0910	91.0	ug/L	50 - 150
Copper-63	0.50000	0.518	104	ug/L	50 - 150
Copper-65	0.50000	0.549	110	ug/L	50 - 150
Zinc-66	6.0000	6.27	105	ug/L	50 - 150
Zinc-67	6.0000	5.56	92.6	ug/L	50 - 150

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Calibration: GG00039
Laboratory ID: SLG0175-HCV1
Sequence: SLG0175
Standard ID: L007534

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Arsenic-75a	200.00	203	1.5	10.00
Cadmium-111	200.00	199	-0.4	10.00
Cadmium-114	200.00	197	-1.5	10.00
Copper-63	200.00	194	-2.8	10.00
Copper-65	200.00	200	0.2	10.00
Zinc-66	200.00	200	-0.01	10.00
Zinc-67	200.00	191	-4.7	10.00

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023
Calibration: GG00039
Laboratory ID: SLG0175-HCV2
Sequence: SLG0175
Standard ID: L007306

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Arsenic-75a	300.00	302	0.8	10.00
Cadmium-111	300.00	297	-0.9	10.00
Cadmium-114	300.00	300	0.1	10.00
Copper-63	300.00	290	-3.2	10.00
Copper-65	300.00	294	-2.0	10.00
Zinc-66	300.00	285	-4.9	10.00
Zinc-67	300.00	281	-6.4	10.00

* Values outside of QC limits

Analytical Resources, LLC
Analytical Chemists and Consultants

HOLDING TIME SUMMARY

Analysis: EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-2023

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
SIB-SED-MG-AAM169-NW-06172 23F0627-01	06/18/23 13:20	06/27/23 09:37	07/12/23 10:49	23	730	07/14/23 22:56	26	730	

* Indicates hold time exceedance.

Analytical Resources, LLC
Analytical Chemists and Consultants

METHOD DETECTION AND REPORTING LIMITS

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC
SDG: 23F0627
Client: HydroGeoLogic, Inc.
Project: Portland Harbor Superfund Site 2021-202
Matrix: Solid
Instrument: ICPMS1

Analyte	MDL	LOD	Units
Arsenic-75a	0.04	0.10	mg/kg
Cadmium-111	0.03	0.05	mg/kg
Cadmium-114	0.04	0.05	mg/kg
Copper-63	0.17	0.34	mg/kg
Copper-65	0.35	0.35	mg/kg
Zinc-66	2.9	4.0	mg/kg
Zinc-67	0.9	2.0	mg/kg

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CERTIFICATE OF ANALYSIS

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info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCU10
Lot Number:	P2-CU682108
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Copper
Starting Material:	Cu Metal
Starting Material Lot#:	2095
Starting Material Purity:	99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 30 µg/mL

Density: 1.032 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9977 ± 50 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 121207

Assay Method #2 **10024 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10007 ± 46 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.007542	M	Eu	<	0.000942	O	Na		0.001434	M	Se	<	0.016971	M	Zn	<	0.005657
O	Al	<	0.000609	O	Fe		0.008700	M	Nb	<	0.000942	O	Si		0.003052	M	Zr	<	0.000942
M	As	<	0.010371	M	Ga	<	0.000942	M	Nd	<	0.000942	M	Sm	<	0.000942				
M	Au	<	0.001885	M	Gd	<	0.000942	M	Ni		0.003781	M	Sn	<	0.005657				
O	B		0.003663	M	Ge	<	0.005657	M	Os	<	0.000942	M	Sr	<	0.000942				
M	Ba		0.004253	M	Hf	<	0.000942	O	P	<	0.031668	M	Ta	<	0.000942				
M	Be	<	0.000942	O	Hg	<	0.007064	M	Pb		0.005789	M	Tb	<	0.000942				
M	Bi	<	0.000942	M	Ho	<	0.000942	M	Pd	<	0.000942	M	Te	<	0.004714				
O	Ca		0.002304	M	In	<	0.000942	M	Pr	<	0.000942	M	Th	<	0.000942				
M	Cd	<	0.000942	M	Ir	<	0.000942	M	Pt	<	0.000942	O	Ti	<	0.002801				
M	Ce	<	0.000942	O	K		0.000763	M	Rb	<	0.000942	M	Tl	<	0.000942				
M	Co		0.001890	M	La	<	0.000942	M	Re	<	0.000942	M	Tm	<	0.000942				
M	Cr	<	0.005657	O	Li	<	0.000243	i	Rh	<		M	U	<	0.000942				
M	Cs	<	0.000942	M	Lu	<	0.000942	M	Ru	<	0.039588	M	V	<	0.003771				
s	Cu	<		O	Mg		0.000320	O	S		0.007174	M	W	<	0.005657				
M	Dy	<	0.000942	O	Mn		0.000793	M	Sb	<	0.001885	M	Y	<	0.000942				
M	Er	<	0.000942	M	Mo	<	0.005657	M	Sc	<	0.000942	M	Yb	<	0.000942				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4, HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Cu Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/.002 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/.001 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/.001 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 24, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 24, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGPB10
Lot Number:	S2-PB713228
Matrix:	0.5% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Lead
Starting Material:	Lead Nitrate
Starting Material Lot#:	2343
Starting Material Purity:	99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10042 ± 31 µg/mL

Density: 1.015 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10024 ± 41 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 101026

Assay Method #2 **10054 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000310	M	Eu	<	0.000310	M	Na		0.001470	M	Se	<	0.009100	O	Zn		0.006155
O	Al		0.017098	O	Fe		0.002496	M	Nb	<	0.000310	O	Si		0.003761	O	Zr	<	0.001700
M	As	<	0.003100	M	Ga	<	0.000310	M	Nd	<	0.000310	M	Sm	<	0.000310				
M	Au	<	0.000910	M	Gd	<	0.000310	O	Ni		0.001709	M	Sn	<	0.001300				
O	B	<	0.005600	M	Ge	<	0.002200	M	Os	<	0.000310	O	Sr		0.000444				
O	Ba		0.007865	M	Hf	<	0.000310	O	P	<	0.038000	M	Ta	<	0.000310				
O	Be	<	0.000320	M	Hg	<	0.002200	s	Pb	<		M	Tb	<	0.000610				
M	Bi	<	0.028000	M	Ho	<	0.000310	M	Pd	<	0.000610	M	Te	<	0.000310				
O	Ca		0.019834	M	In	<	0.000310	M	Pr	<	0.000310	M	Th	<	0.000310				
O	Cd	<	0.000630	M	Ir	<	0.000310	M	Pt	<	0.000910	O	Ti		0.005129				
M	Ce		0.004787	O	K		0.008207	M	Rb	<	0.006700	M	Tl	<	0.016000				
M	Co	<	0.000610	M	La	<	0.001900	M	Re	<	0.000310	M	Tm	<	0.000310				
O	Cr	<	0.001500	O	Li	<	0.000110	O	Rh	<	0.007700	M	U	<	0.000310				
M	Cs	<	0.006100	M	Lu	<	0.000310	M	Ru	<	0.001300	M	V	<	0.001600				
M	Cu	<	0.001600	O	Mg		0.003317	O	S	<	0.052000	M	W	<	0.000910				
M	Dy	<	0.000310	O	Mn	<	0.001600	O	Sb	<	0.015000	M	Y	<	0.000310				
M	Er	<	0.000310	M	Mo	<	0.000610	O	Sc	<	0.000630	M	Yb	<	0.000310				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.20 +2 6 Pb(H2O)6+2

Chemical Compatibility - Soluble in HCl, HF and HNO3. Avoid H2SO4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Pb Containing Samples (Preparation and Solution) -Metal (Best dissolved in 1:1 H2O / HNO3); Oxides (The many different Pb oxides are soluble in HNO3 with the exception of PbO2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H2O / HNO3); Organic Matrices (Dry ash and dissolve in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 208 amu	5 ppt	n/a	192Pt16O, 192Os16O
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	Co
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	W, Ir, Hf, Sb, Th
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	Bi, Nb

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 10, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 10, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

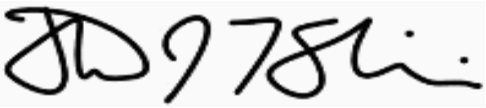
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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Christiansburg, VA 24073 USA
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1.0 ACCREDITATION / REGISTRATION

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ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGZN10
Lot Number:	S2-ZN711249
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Zinc
Starting Material:	Zinc Metal
Starting Material Lot#:	2349
Starting Material Purity:	99.9988%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 30 µg/mL

Density: 1.029 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9981 ± 56 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 120629

Assay Method #2 **9987 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10002 ± 32 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002000	M	Eu	<	0.000500	O	Na		0.008713	M	Se	<	0.048000	s	Zn	<	
O	Al	<	0.011000	O	Fe		0.015467	M	Nb	<	0.000500	O	Si		0.007842	M	Zr	<	0.000500
O	As	<	0.012000	M	Ga	<	0.004900	M	Nd	<	0.000500	M	Sm	<	0.000500				
M	Au	<	0.006500	M	Gd	<	0.000500	O	Ni		0.003049	M	Sn		0.002614				
O	B	<	0.019000	M	Ge	<	0.009100	M	Os	<	0.000500	M	Sr	<	0.000500				
M	Ba	<	0.000500	M	Hf	<	0.000500	O	P	<	0.059000	M	Ta	<	0.000500				
O	Be	<	0.000230	O	Hg	<	0.003800	M	Pb		0.016774	M	Tb	<	0.000500				
M	Bi	<	0.002400	M	Ho	<	0.000500	M	Pd	<	0.001000	M	Te	<	0.017000				
O	Ca		0.052283	M	In	<	0.003500	M	Pr	<	0.000500	M	Th	<	0.000500				
O	Cd		0.000588	M	Ir	<	0.001000	M	Pt	<	0.000500	M	Ti	<	0.002000				
M	Ce	<	0.000500	O	K		0.017209	M	Rb	<	0.002500	M	Tl	<	0.000500				
M	Co		0.000653	M	La	<	0.000500	M	Re	<	0.000500	M	Tm	<	0.000500				
O	Cr		0.001089	O	Li	<	0.000230	M	Rh	<	0.000500	M	U	<	0.000500				
M	Cs	<	0.000500	M	Lu	<	0.000500	M	Ru	<	0.005000	M	V	<	0.000500				
O	Cu		0.001938	O	Mg		0.000871	O	S	<	0.048000	M	W	<	0.001000				
M	Dy	<	0.000500	O	Mn		0.000172	M	Sb	<	0.004300	M	Y	<	0.000500				
M	Er	<	0.000500	M	Mo	<	0.001500	O	Sc	<	0.000900	M	Yb	<	0.000500				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 22, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 22, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

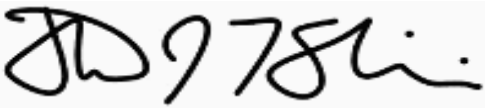
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGSE10
Lot Number:	S2-SE711004
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Selenium
Starting Material:	Se Metal
Starting Material Lot#:	1962
Starting Material Purity:	99.9991%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9955 ± 61 µg/mL

Density: 1.035 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9955 ± 50 µg/mL**
ICP Assay NIST SRM 3149 Lot Number: 100901

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002242	M	Eu	<	0.000373	O	Na		0.013654	s	Se	<		O	Zn		0.002374
M	Al		0.004450	M	Fe		0.008478	O	Nb	<	0.002975	O	Si		0.006249	M	Zr	<	0.001868
O	As	<	0.022040	M	Ga	<	0.000373	M	Nd	<	0.000373	M	Sm	<	0.000373				
M	Au	<	0.000373	M	Gd	<	0.000373	O	Ni		0.001843	M	Sn		0.000847				
O	B	<	0.007714	M	Ge	<	0.002616	M	Os	<	0.000373	M	Sr	<	0.001121				
M	Ba	<	0.001495	M	Hf	<	0.000373	O	P	<	0.022040	M	Ta	<	0.000373				
M	Be	<	0.001495	M	Hg	<	0.002240	M	Pb		0.006358	M	Tb	<	0.006353				
M	Bi	<	0.000373	M	Ho	<	0.000373	M	Pd	<	0.000373	M	Te	<	0.012707				
O	Ca		0.006530	M	In	<	0.000373	M	Pr	<	0.001495	M	Th	<	0.002990				
M	Cd		0.001165	M	Ir	<	0.000373	M	Pt	<	0.000373	M	Ti	<	0.003363				
M	Ce	<	0.000373	O	K		0.001999	M	Rb	<	0.001868	M	Tl		0.008584				
M	Co	<	0.000373	M	La	<	0.001121	M	Re	<	0.000373	M	Tm	<	0.000373				
M	Cr		0.002861	O	Li		0.000062	M	Rh	<	0.000373	M	U	<	0.000373				
M	Cs	<	0.001121	M	Lu	<	0.000373	M	Ru	<	0.001493	M	V	<	0.000747				
M	Cu	<	0.000747	O	Mg		0.001156	O	S		0.024591	M	W	<	0.002242				
M	Dy	<	0.000373	M	Mn	<	0.000373	M	Sb	<	0.002242	M	Y	<	0.000373				
M	Er	<	0.000373	O	Mo	<	0.003195	M	Sc	<	0.001121	M	Yb	<	0.000373				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96 +4 6 H_2SeO_3

Chemical Compatibility -Soluble in HCl, HNO_3,H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) -Metal (soluble in HNO_3); Oxides (readily soluble in water); Minerals and alloys (acid digestion with HNO_3or HNO_3 / HF); Organic Matrices (acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 82 amu	200 ppt	N/A	12C35Cl2
ICP-OES 196.026 nm	0.08/0.006 µg/mL	1	Fe
ICP-OES 203.985 nm	0.2/0.05 µg/mL	1	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3/0.16 µg/mL	1	Cr, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 17, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 17, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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Christiansburg, VA 24073 USA
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F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMO10
Lot Number:	S2-MO706255
Matrix:	H2O tr. NH4OH
Value / Analyte(s):	10 000 µg/mL ea: Molybdenum
Starting Material:	Ammonium Molybdate
Starting Material Lot#:	2361
Starting Material Purity:	99.9893%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10026 ± 47 µg/mL

Density: 1.011 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10032 ± 68 µg/mL**
ICP Assay NIST SRM 3134 Lot Number: 130418

Assay Method #2 **10020 ± 65 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000590	M	Eu	<	0.000300	M	Na		0.008739	M	Se	<	0.008000	M	Zn		0.005942
M	Al		0.005592	M	Fe	<	0.006500	M	Nb	<	0.029000	i	Si	<		M	Zr	<	0.001800
M	As	<	0.002100	M	Ga	<	0.000300	i	Nd	<		M	Sm	<	0.000300				
M	Au	<	0.000300	M	Gd	<	0.000300	M	Ni	<	0.008000	M	Sn	<	0.008900				
M	B	<	0.003300	M	Ge	<	0.000300	M	Os	<	0.000590	M	Sr		0.001747				
M	Ba		0.016778	M	Hf	<	0.001800	i	P	<		M	Ta	<	0.004200				
M	Be	<	0.000890	M	Hg	<	0.003300	M	Pb	<	0.000300	M	Tb	<	0.000300				
M	Bi	<	0.000890	M	Ho	<	0.000300	M	Pd	<	0.001800	M	Te	<	0.021000				
O	Ca		0.062920	M	In	<	0.032000	M	Pr	<	0.013000	M	Th	<	0.000300				
O	Cd	<	0.026000	M	Ir	<	0.000300	M	Pt	<	0.000300	O	Ti	<	0.032000				
M	Ce	<	0.008300	M	K		1.293372	M	Rb		0.045442	M	Tl		0.012584				
M	Co		0.005942	M	La	<	0.000300	M	Re	<	0.000300	M	Tm	<	0.000300				
M	Cr		0.005243	O	Li		0.000594	M	Rh	<	0.000300	M	U	<	0.005300				
M	Cs		0.005243	M	Lu	<	0.000300	M	Ru	<	0.079000	M	V	<	0.000890				
M	Cu		0.022371	M	Mg		0.005592	i	S	<		M	W		0.873900				
M	Dy	<	0.000300	M	Mn	<	0.005900	M	Sb		0.015031	M	Y	<	0.000300				
M	Er	<	0.000300	s	Mo	<		M	Sc	<	0.001200	M	Yb	<	0.000300				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]-2(chemical form as received)

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH) ; Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 95 amu	3 ppt	n/a	40Ar39K16O,79Br16O,190Os2+,190Pt2+
ICP-OES 202.030 nm	0.008 / 0.0002 µg/mL	1	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 µg/mL	1	
ICP-OES 204.598 nm	0.012 / 0.001 µg/mL	1	Ir, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

July 04, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **July 04, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
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P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGTL10
Lot Number:	T2-TL714687
Matrix:	5% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Thallium
Starting Material:	TlNO3
Starting Material Lot#:	2118
Starting Material Purity:	99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10030 ± 42 µg/mL

Density: 1.036 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10040 ± 43 µg/mL**
ICP Assay NIST SRM 3158 Lot Number: 151215

Assay Method #2 **10010 ± 65 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL(

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000200	M	Eu	<	0.000200	O	Na		0.002489	M	Se	<	0.011019	O	Zn		0.002298
O	Al	<	0.004184	O	Fe	<	0.002824	M	Nb	<	0.000200	O	Si		0.003760	M	Zr	<	0.000200
M	As	<	0.002003	M	Ga	<	0.000200	M	Nd	<	0.000200	M	Sm	<	0.000200				
O	Au	<	0.002824	M	Gd	<	0.000200	M	Ni		0.001724	M	Sn	<	0.000601				
O	B	<	0.004184	M	Ge	<	0.000801	M	Os	<	0.000198	O	Sr	<	0.000313				
M	Ba	<	0.000400	M	Hf	<	0.000200	O	P	<	0.010460	M	Ta	<	0.000200				
O	Be	<	0.000104	M	Hg	<	0.000794	M	Pb		0.000811	M	Tb	<	0.000200				
M	Bi	<	0.005209	M	Ho	<	0.000200	M	Pd	<	0.000400	M	Te	<	0.005008				
O	Ca		0.002436	M	In	<	0.000200	M	Pr	<	0.000200	M	Th	<	0.000200				
M	Cd		0.001318	M	Ir	<	0.000198	M	Pt	<	0.000801	O	Ti	<	0.001255				
M	Ce	<	0.000200	O	K		0.006175	M	Rb	<	0.000200	s	Tl	<					
M	Co	<	0.000601	M	La	<	0.000200	M	Re	<	0.000200	M	Tm	<	0.000200				
M	Cr	<	0.000801	O	Li	<	0.000177	M	Rh	<	0.000200	M	U	<	0.000200				
M	Cs	<	0.003606	M	Lu	<	0.000200	M	Ru	<	0.000397	M	V	<	0.002203				
M	Cu	<	0.001001	O	Mg		0.000529	O	S	<	0.015690	M	W	<	0.000601				
M	Dy	<	0.000200	M	Mn	<	0.000801	M	Sb	<	0.000400	M	Y	<	0.000200				
M	Er	<	0.000200	M	Mo	<	0.001202	O	Sc	<	0.000711	M	Yb	<	0.000200				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.38 +1 6 Tl(H2O)61+

Chemical Compatibility - Soluble in HCl, HNO3, and H2SO4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Tl Containing Samples)Preparation and Solution) -Metal (Best dissolved in HNO3 which forms chiefly the Tl1+ ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 205 amu	2 ppt	N/A	189Os16O
ICP-OES 190.864 nm	0.04 / 0.004 µg/mL	1	V, Ti
ICP-OES 276.787 nm	0.1 / 0.01 µg/mL	1	Ta, V, Fe, Cr
ICP-OES 351.924 nm	0.2 / 0.02 µg/mL	1	Th, Ce, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

February 08, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **February 08, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

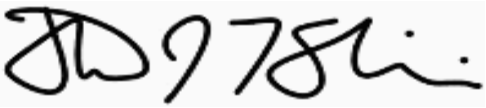
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCD10
Lot Number:	S2-CD710508
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Cadmium
Starting Material:	Cd Metal
Starting Material Lot#:	1953
Starting Material Purity:	99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10008 ± 30 µg/mL

Density: 1.029 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10010 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #2 **10011 ± 30 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 130116

Assay Method #3 **10003 ± 30 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Ag	<	0.003200	O	Eu	<	0.002500	O	Na		0.005499	M	Se	<	0.005700	O	Zn	<	0.001100
O	Al		0.008903	O	Fe		0.000602	M	Nb	<	0.000400	O	Si		0.016758	O	Zr	<	0.002600
M	As	<	0.003600	M	Ga	<	0.001200	M	Nd	<	0.000800	M	Sm	<	0.000400				
M	Au	<	0.000810	M	Gd	<	0.000400	M	Ni	<	0.003600	M	Sn	<	0.003200				
O	B		0.004189	O	Ge	<	0.012000	M	Os	<	0.000810	O	Sr	<	0.000330				
M	Ba	<	0.002400	M	Hf	<	0.000400	O	P	<	0.022000	M	Ta	<	0.000800				
M	Be	<	0.000400	M	Hg	<	0.001700	M	Pb	<	0.002400	M	Tb	<	0.000400				
M	Bi	<	0.000400	M	Ho	<	0.000400	M	Pd	<	0.001200	M	Te	<	0.008000				
O	Ca		0.011259	O	In	<	0.013000	M	Pr	<	0.000400	M	Th	<	0.000400				
s	Cd	<		M	Ir	<	0.000410	M	Pt	<	0.000400	O	Ti		0.000602				
M	Ce	<	0.000400	O	K		0.005237	M	Rb	<	0.004400	M	Tl		0.000523				
M	Co	<	0.000400	M	La	<	0.000400	M	Re	<	0.000400	M	Tm	<	0.000400				
O	Cr	<	0.005100	O	Li	<	0.000054	M	Rh	<	0.000400	M	U	<	0.000400				
M	Cs	<	0.002400	M	Lu	<	0.000400	M	Ru	<	0.002500	M	V	<	0.002000				
O	Cu	<	0.004800	O	Mg		0.000288	O	S	<	0.022000	M	W	<	0.000400				
M	Dy	<	0.000400	O	Mn	<	0.000860	O	Sb	<	0.018000	M	Y	<	0.000400				
M	Er	<	0.000400	M	Mo	<	0.001600	O	Sc	<	0.000430	M	Yb	<	0.000400				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd2(OH) (aq)3+ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 , and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3 / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO3); Oxides (soluble in HCl or HNO3); Ores (dissolve in HCl /HNO3 then take to fumes with H2SO4. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 01, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 01, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMN10
Lot Number:	S2-MN704240
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Manganese
Starting Material:	Mn Metal
Starting Material Lot#:	2275
Starting Material Purity:	99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10011 ± 30 µg/mL

Density: 1.035 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9989 ± 69 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 050429

Assay Method #2 **10011 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10024 ± 47 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001500	M	Eu	<	0.000730	O	Na		0.176097	M	Se	<	0.006600	M	Zn		0.009925
O	Al		0.004322	M	Fe	<	0.650000	M	Nb	<	0.000730	O	Si		0.097654	M	Zr	<	0.000730
M	As	<	0.008000	M	Ga		0.004322	M	Nd	<	0.001500	M	Sm	<	0.000730				
M	Au	<	0.000730	M	Gd	<	0.000730	M	Ni		0.024013	M	Sn	<	0.002200				
M	B		0.068838	M	Ge	<	0.004400	M	Os	<	0.000730	O	Sr		0.000928				
M	Ba	<	0.001500	M	Hf	<	0.000730	i	P	<		M	Ta	<	0.000730				
M	Be	<	0.000730	M	Hg	<	0.002200	M	Pb		0.007364	M	Tb	<	0.000730				
M	Bi	<	0.003000	M	Ho	<	0.000730	M	Pd	<	0.000730	M	Te	<	0.019000				
O	Ca		0.062434	M	In	<	0.003000	M	Pr	<	0.000730	M	Th	<	0.000730				
M	Cd	<	0.001500	M	Ir	<	0.000730	M	Pt	<	0.000730	O	Ti	<	0.006500				
M	Ce	<	0.007300	O	K		0.006403	M	Rb	<	0.006600	M	Tl	<	0.000730				
O	Co		0.014728	M	La	<	0.003000	M	Re	<	0.000730	M	Tm	<	0.000730				
O	Cr		0.272151	O	Li		0.000416	M	Rh	<	0.003000	M	U	<	0.001500				
M	Cs	<	0.000730	M	Lu	<	0.000730	M	Ru	<	0.004400	M	V	<	0.000730				
O	Cu		0.007684	O	Mg		0.320177	i	S	<		M	W	<	0.004400				
M	Dy	<	0.001500	s	Mn	<		M	Sb	<	0.021000	O	Y		0.001360				
M	Er	<	0.001500	M	Mo		0.010245	O	Sc	<	0.004100	M	Yb	<	0.000730				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO3/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H2SO4 and heat to SO3 fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 17, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 17, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGSB10
Lot Number:	R2-SB688559
Matrix:	3% (v/v) HNO3 3% (w/v) tartaric acid
Value / Analyte(s):	10 000 µg/mL ea: Antimony
Starting Material:	Antimony Metal
Starting Material Lot#:	1857
Starting Material Purity:	99.9894%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10003 ± 47 µg/mL

Density: 1.061 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10003 ± 41 µg/mL**
ICP Assay NIST SRM 3102a Lot Number: 140911

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$
w_i = the weighting factors for each method calculated using the inverse square of the variance:
$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2
$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method
u_{bb} = bottle to bottle homogeneity standard uncertainty
u_{lts} = long term stability standard uncertainty (storage)
u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with
$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2
$u_{char\ a}$ = the errors from characterization
u_{bb} = bottle to bottle homogeneity standard uncertainty
u_{lts} = long term stability standard uncertainty (storage)
u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000200	M	Eu	<	0.000300	O	Na		0.140000	M	Se	<	0.007300	O	Zn		0.005000
M	Al		0.003200	O	Fe		0.060000	M	Nb	<	0.000100	O	Si		0.150000	O	Zr	<	0.006300
M	As	<	0.004400	M	Ga	<	0.000400	M	Nd	<	0.000100	M	Sm	<	0.000100				
M	Au	<	0.000210	M	Gd	<	0.000100	O	Ni		0.004800	M	Sn	<	0.001800				
M	B	<	0.011000	M	Ge	<	0.000600	M	Os	<	0.000110	O	Sr		0.000750				
O	Ba	<	0.004900	M	Hf	<	0.000100	O	P		0.540000	M	Ta		0.003300				
M	Be	<	0.000400	M	Hg	<	0.000110	M	Pb	<	0.000400	M	Tb	<	0.000100				
M	Bi	<	0.000200	M	Ho	<	0.000100	M	Pd	<	0.000210	M	Te	<	0.000600				
O	Ca		0.110000	M	In	<	0.000100	M	Pr	<	0.001600	M	Th	<	0.000100				
M	Cd	<	0.000200	M	Ir	<	0.000110	M	Pt	<	0.000600	M	Ti	<	0.002800				
M	Ce		0.006500	O	K		0.020000	M	Rb	<	0.001000	M	Tl	<	0.000100				
M	Co	<	0.000200	O	La	<	0.016000	M	Re	<	0.000100	M	Tm	<	0.000100				
M	Cr		0.006900	O	Li	<	0.000430	M	Rh	<	0.000300	M	U	<	0.000100				
M	Cs	<	0.000200	M	Lu	<	0.000100	M	Ru	<	0.000310	M	V	<	0.000800				
M	Cu	<	0.000600	O	Mg		0.021000	n	S	<		M	W	<	0.000200				
M	Dy	<	0.000100	O	Mn		0.001900	s	Sb	<		M	Y	<	0.000100				
M	Er	<	0.000100	M	Mo	<	0.000500	O	Sc	<	0.002300	M	Yb	<	0.000100				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75 +3 6 Sb(O)C4H4O6-1

Chemical Compatibility -Stable in conc. HCl, dilute or conc. HF. Stable in dilute HNO3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO3 / LDPE container.

Sb Containing Samples (Preparation and Solution) -Metal and alloys (Soluble in H2O / HF / HNO3 mixture); Oxides (Soluble in HCl and tartaric acid or H2O / HF / HNO3 mixtures); Ores (fusion with Na2CO3 in Pt0 followed by dissolving the fuseate in a H2O / HF / HNO3 mixture); Organic based (sulfuric acid / hydrogen peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 121 amu	5 ppt	N/A	105Pd16O, 89Y16O2
ICP-OES 206.833 nm	0.03/0.003 µg/mL	1	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05/0.005 µg/mL	1	Nb, W, Re, Fe
ICP-OES 231.147 nm	0.06/0.006 µg/mL	1	Ni, Co, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 30, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 30, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAS10
Lot Number:	T2-AS718260
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Arsenic
Starting Material:	As Metal
Starting Material Lot#:	2208
Starting Material Purity:	99.9971%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10060 ± 40 µg/mL

Density: 1.037 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10062 ± 46 µg/mL**
ICP Assay NIST SRM 3103a Lot Number: 100818

Assay Method #2 **10055 ± 76 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.003200	M	Eu	<	0.000530	O	Na		0.032544	M	Se	<	0.006300	O	Zn		0.001952
M	Al		0.007593	O	Fe		0.001475	O	Nb	<	0.012000	O	Si		0.238658	O	Zr	<	0.004100
s	As	<		M	Ga	<	0.000530	M	Nd	<	0.000530	M	Sm	<	0.000530				
M	Au	<	0.003100	M	Gd	<	0.000530	M	Ni	<	0.002100	M	Sn	<	0.000530				
M	B		0.026035	M	Ge	<	0.001600	M	Os	<	0.000520	M	Sr	<	0.000530				
M	Ba	<	0.000530	M	Hf	<	0.000530	O	P	<	0.043000	M	Ta	<	0.000530				
O	Be	<	0.000360	M	Hg	<	0.001600	M	Pb	<	0.002100	M	Tb	<	0.000530				
M	Bi	<	0.000530	M	Ho	<	0.000530	M	Pd	<	0.001100	M	Te	<	0.004700				
O	Ca		0.004339	M	In	<	0.023000	M	Pr	<	0.005300	M	Th	<	0.000530				
M	Cd	<	0.001100	M	Ir	<	0.000520	M	Pt	<	0.000530	O	Ti	<	0.002300				
M	Ce	<	0.000530	O	K		0.002061	M	Rb	<	0.000530	M	Tl	<	0.000530				
M	Co	<	0.000530	M	La	<	0.001100	M	Re	<	0.000530	M	Tm	<	0.000530				
O	Cr	<	0.001800	O	Li	<	0.000120	M	Rh	<	0.000530	M	U	<	0.000530				
M	Cs	<	0.005300	M	Lu	<	0.000530	M	Ru	<	0.000520	M	V	<	0.002700				
M	Cu	<	0.001600	O	Mg		0.000154	O	S		0.028205	M	W	<	0.012000				
M	Dy	<	0.000530	O	Mn		0.000154	M	Sb	<	0.000530	M	Y	<	0.000530				
M	Er	<	0.000530	M	Mo	<	0.000530	O	Sc	<	0.001700	M	Yb	<	0.000530				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H3AsO4 and HAsO2

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO3,H3PO4, H2SO4 and HF aqueous matrices water and NH4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO3 / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H2O / HNO3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphic form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K2CO3 and KNO3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na2CO3 / Na2O2 mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37Cl,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 10, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 10, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
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Christiansburg, VA 24073 · USA
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CERTIFICATE OF ANALYSIS

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGBA10
Lot Number:	R2-BA692576
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Barium
Starting Material:	Barium Nitrate
Starting Material Lot#:	1969
Starting Material Purity:	99.9982%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10022 ± 30 µg/mL

Density: 1.025 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10018 ± 50 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 140909

Assay Method #2 **10023 ± 31 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #3 **10023 ± 30 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000410	O	Eu	<	0.005200	O	Na		0.004610	M	Se	<	0.003700	O	Zn		0.000658
M	Al	<	0.003100	O	Fe		0.015707	M	Nb	<	0.000210	O	Si		0.005573	M	Zr	<	0.001300
M	As	<	0.001300	M	Ga	<	0.000210	M	Nd	<	0.000210	O	Sm	<	0.021000				
M	Au	<	0.001300	M	Gd	<	0.000210	M	Ni	<	0.000810	M	Sn	<	0.000410				
O	B	<	0.005200	M	Ge	<	0.002500	M	Os	<	0.000410	O	Sr		0.003850				
s	Ba	<		M	Hf	<	0.000810	O	P	<	0.026000	M	Ta	<	0.000410				
O	Be	<	0.000320	M	Hg	<	0.000210	M	Pb	<	0.002300	M	Tb	<	0.000210				
M	Bi	<	0.000210	M	Ho	<	0.000210	M	Pd	<	0.000210	M	Te	<	0.001900				
O	Ca		0.007093	M	In	<	0.000210	M	Pr	<	0.000210	M	Th	<	0.000210				
M	Cd	<	0.000210	M	Ir	<	0.000210	M	Pt	<	0.000210	M	Ti	<	0.002100				
M	Ce	<	0.001300	O	K		0.035467	M	Rb	<	0.002100	M	Tl	<	0.000210				
M	Co	<	0.000410	O	La	<	0.005200	M	Re	<	0.000210	M	Tm	<	0.000410				
M	Cr	<	0.001700	O	Li	<	0.000630	M	Rh	<	0.000210	M	U	<	0.000210				
M	Cs	<	0.003300	M	Lu	<	0.001700	M	Ru	<	0.000210	O	V	<	0.005200				
M	Cu	<	0.001300	O	Mg		0.000861	O	S		0.268539	M	W	<	0.000410				
M	Dy	<	0.000210	M	Mn	<	0.000410	M	Sb	<	0.001300	O	Y	<	0.005200				
M	Er	<	0.001300	M	Mo	<	0.000410	M	Sc	<	0.000410	M	Yb	<	0.001300				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33 +2 6 Ba(H2O)6+2
Chemical Compatibility - Soluble in HCl, and HNO3. Avoid H2SO4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO3 / LDPE container.
Ba Containing Samples (Preparation and Solution) -Metal(is best dissolved in diluted HNO3); Ores(Carbonate fusion in Pt0 followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl / tartaric acid to prevent BaSO4 precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 138 amu	1 ppt	N/A	122Sn16O, 122Te16O
ICP-OES 230.424 nm	0.004/0.0005 µg/mL	1	Mo, Ir, Co
ICP-OES 233.527 nm	0.004/0.0003 µg/mL	1	
ICP-OES 455.403 nm	0.002/0.0001 µg/mL	1	Zr, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 11, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 11, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGBE10
Lot Number:	R2-BE692992
Matrix:	6% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Beryllium
Starting Material:	Beryllium Acetate
Starting Material Lot#:	2281
Starting Material Purity:	99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10032 ± 41 µg/mL

Density: 1.128 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10042 ± 67 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 090514

Assay Method #2 **10025 ± 51 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001100	M	Eu	<	0.000270	O	Na		0.040962	M	Se	<	0.005000	M	Zn		0.013054
O	Al		0.016205	O	Fe		0.015754	M	Nb	<	0.000270	O	Si		0.024307	O	Zr	<	0.001900
M	As	<	0.002900	M	Ga	<	0.000270	M	Nd	<	0.000270	M	Sm	<	0.000270				
M	Au	<	0.000520	M	Gd	<	0.000270	M	Ni	<	0.003700	M	Sn	<	0.000790				
M	B	<	0.091000	M	Ge	<	0.000270	M	Os	<	0.000260	M	Sr		0.000630				
M	Ba		0.002700	M	Hf	<	0.000270	O	P	<	0.066000	M	Ta	<	0.000270				
s	Be	<		M	Hg	<	0.000520	M	Pb	<	0.000270	M	Tb	<	0.000270				
M	Bi	<	0.000530	M	Ho	<	0.000270	M	Pd	<	0.000520	M	Te	<	0.003700				
O	Ca		0.072022	M	In	<	0.000790	M	Pr	<	0.000270	M	Th	<	0.000270				
M	Cd	<	0.000790	M	Ir	<	0.000260	M	Pt	<	0.000270	O	Ti	<	0.000400				
M	Ce	<	0.000270	O	K		0.045014	M	Rb	<	0.000270	M	Tl	<	0.000790				
O	Co	<	0.003200	M	La	<	0.000270	M	Re	<	0.000270	M	Tm	<	0.000270				
O	Cr	<	0.001800	O	Li	<	0.000660	M	Rh	<	0.001100	M	U	<	0.000270				
M	Cs		0.001440	M	Lu	<	0.000270	M	Ru	<	0.000260	M	V	<	0.000790				
M	Cu	<	0.002100	O	Mg		0.016205	i	S	<		M	W	<	0.000530				
M	Dy	<	0.000270	M	Mn		0.001215	M	Sb	<	0.000270	M	Y	<	0.000270				
M	Er	<	0.000270	M	Mo	<	0.000530	O	Sc	<	0.000930	M	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01 +2 4 Be(H2O)4+2

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1 % HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO3 / LDPE container.

Be Containing Samples (Preparation and Solution) - Meta l(is best dissolved in diluted H2SO4); BeO (boiling nitric, hydrochloric, or sulfuric acids or KHSO4 fusion); Ores (H2SO4/HF digestion or carbonate fusion in Pt0); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 9 amu	4 ppt	N/A	
ICP-OES 234.861 nm	0.0003/0.00016 µg/mL	1	Fe, Ta, Mo
ICP-OES 313.042 nm	0.0003/0.00009 µg/mL	1	V, Ce, U
ICP-OES 313.107 nm	0.0007/0.0005 µg/mL	1	Ce, Th, Tm

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION, PERIOD OF VALIDITY AND REVISION HISTORY

11.1 Certification Issue Date

May 13, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 13, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

11.4 Revision Status

- Revision 1 - Revised on Thursday, Jan 14, 2021 by utruong. Revision was made for the following reason: Modified Section 7 Chemical Form in Solution.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCO10
Lot Number:	R2-CO695285
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Cobalt
Starting Material:	Co Metal
Starting Material Lot#:	2326
Starting Material Purity:	99.9934%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10012 ± 31 µg/mL

Density: 1.056 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10031 ± 67 µg/mL**
ICP Assay NIST SRM 3113 Lot Number: 190630

Assay Method #2 **10019 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10000 ± 35 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag		0.014660	M	Eu	<	0.000590	O	Na		0.007534	M	Se	<	0.019000	M	Zn		0.003461
M	Al	<	0.024000	M	Fe		0.050905	M	Nb	<	0.000590	O	Si		0.075340	M	Zr	<	0.001200
i	As	<		M	Ga	<	0.000590	M	Nd	<	0.000590	M	Sm	<	0.000590				
M	Au	<	0.004100	M	Gd	<	0.000590	O	Ni		0.427608	M	Sn	<	0.001200				
M	B	<	0.031000	M	Ge	<	0.003000	M	Os	<	0.000590	O	Sr	<	0.000260				
M	Ba	<	0.000590	M	Hf	<	0.000590	n	P	<		M	Ta	<	0.001200				
O	Be	<	0.001300	M	Hg	<	0.001800	M	Pb		0.003257	M	Tb	<	0.000590				
M	Bi	<	0.003000	M	Ho	<	0.000590	M	Pd	<	0.000590	M	Te	<	0.005300				
O	Ca		0.010588	M	In	<	0.001200	M	Pr	<	0.000590	M	Th	<	0.000590				
M	Cd	<	0.004700	M	Ir	<	0.001200	M	Pt	<	0.002400	M	Ti	<	0.014000				
M	Ce	<	0.000590	O	K		0.008144	M	Rb	<	0.000590	M	Tl		0.002647				
s	Co	<		M	La	<	0.000590	M	Re	<	0.000590	M	Tm	<	0.000590				
M	Cr	<	0.021000	O	Li	<	0.000130	M	Rh	<	0.000590	M	U	<	0.000590				
M	Cs	<	0.002400	M	Lu	<	0.000590	M	Ru	<	0.007100	O	V	<	0.000880				
M	Cu		0.189369	O	Mg		0.001893	n	S	<		M	W	<	0.000590				
M	Dy	<	0.000590	M	Mn	<	0.001800	M	Sb	<	0.003600	M	Y	<	0.000590				
M	Er	<	0.000590	M	Mo	<	0.002400	O	Sc	<	0.001600	M	Yb	<	0.000590				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO3); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 04, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 04, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAG10
Lot Number:	S2-AG712977
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Silver
Starting Material:	Ag Shot
Starting Material Lot#:	2289
Starting Material Purity:	99.9951%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10051 ± 30 µg/mL

Density: 1.056 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1	**10051 ± 52 µg/mL** ICP Assay NIST SRM 3151 Lot Number: 160729
Assay Method #2	**10051 ± 19 µg/mL** Volhard NIST SRM 999c Lot Number: 999c
Assay Method #3	**10049 ± 31 µg/mL** Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Ag	<		M	Eu	<	0.000260	O	Na		0.003811	M	Se	<	0.003900	O	Zn		0.048146
M	Al		0.002688	O	Fe		0.006419	M	Nb	<	0.000260	O	Si		0.005215	M	Zr	<	0.000260
M	As	<	0.001100	M	Ga	<	0.000260	M	Nd	<	0.000260	M	Sm	<	0.000260				
M	Au	<	0.000260	M	Gd	<	0.000260	O	Ni		0.001765	M	Sn		0.020060				
O	B	<	0.004300	M	Ge	<	0.002300	M	Os	<	0.001100	O	Sr	<	0.000110				
M	Ba	<	0.000520	M	Hf	<	0.000260	O	P	<	0.017000	M	Ta	<	0.000260				
O	Be	<	0.001100	M	Hg	<	0.000770	M	Pb	<	0.003600	M	Tb	<	0.000260				
M	Bi		0.004814	M	Ho	<	0.000260	M	Pd		0.044134	M	Te	<	0.009000				
O	Ca		0.005215	M	In		0.003691	M	Pr	<	0.000260	M	Th	<	0.000260				
M	Cd	<	0.000260	M	Ir	<	0.000520	M	Pt	<	0.001100	O	Ti	<	0.000440				
M	Ce	<	0.002100	O	K	<	0.008700	M	Rb	<	0.001100	M	Tl	<	0.004100				
O	Co	<	0.000330	M	La	<	0.000260	M	Re	<	0.000260	M	Tm	<	0.000260				
O	Cr	<	0.002500	O	Li	<	0.000110	M	Rh	<	0.000520	M	U	<	0.000260				
M	Cs	<	0.002600	M	Lu	<	0.000260	M	Ru	<	0.000260	M	V	<	0.000260				
O	Cu		0.357085	O	Mg		0.001203	O	S	<	0.017000	M	W	<	0.000260				
M	Dy	<	0.000260	O	Mn	<	0.000220	M	Sb	<	0.014000	M	Y	<	0.000260				
M	Er	<	0.000260	M	Mo	<	0.000260	O	Sc	<	0.000220	M	Yb	<	0.000260				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 $Ag(H_2O)_6^+$

Chemical Compatibility -Stable in HNO_3, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [$AgCl_{x1-x}$] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite , bromide, chloride, iodide, carbonate , chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Ag Containing Samples (Preparation and Solution) -Metal (Soluble in HNO_3); Oxides (Soluble in HNO_3); Ores (Digestion with conc. HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Director, Technical

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCR(3)10
Lot Number:	S2-CR709784
Matrix:	10% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Chromium
Starting Material:	Cr Metal
Starting Material Lot#:	2328
Starting Material Purity:	99.9951%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10027 ± 41 µg/mL

Density: 1.072 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10027 ± 40 µg/mL**
ICP Assay NIST SRM 3112a Lot Number: 170630

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001700	M	Eu	<	0.003400	O	Na		0.090372	M	Se	<	0.012000	O	Zn	<	0.006100
M	Al		0.034916	O	Fe		0.246471	M	Nb	<	0.017000	n	Si	<		M	Zr	<	0.007800
M	As	<	0.028000	O	Ga	<	0.013000	M	Nd	<	0.013000	M	Sm	<	0.006900				
M	Au	<	0.001700	M	Gd	<	0.000560	M	Ni		0.016020	M	Sn		0.006983				
O	B	<	0.025000	O	Ge	<	0.014000	M	Os	<	0.000560	M	Sr		0.006367				
M	Ba	<	0.008900	M	Hf	<	0.000560	i	P	<		M	Ta	<	0.000560				
M	Be	<	0.013000	M	Hg	<	0.001700	M	Pb		0.010064	M	Tb	<	0.000560				
M	Bi	<	0.002300	M	Ho	<	0.000560	M	Pd	<	0.021000	M	Te	<	0.010000				
O	Ca		0.075995	M	In	<	0.000560	M	Pr	<	0.001700	M	Th	<	0.000560				
M	Cd	<	0.000560	M	Ir	<	0.000560	M	Pt	<	0.001200	O	Ti		0.013555				
M	Ce	<	0.001200	O	K		0.043132	i	Rb	<		M	Tl	<	0.000560				
M	Co	<	0.002600	M	La	<	0.001200	M	Re	<	0.001200	O	Tm	<	0.013000				
s	Cr	<		O	Li		0.000390	M	Rh	<	0.095000	M	U	<	0.000560				
M	Cs	<	0.007800	M	Lu	<	0.000560	M	Ru	<	0.087000	O	V		0.014993				
O	Cu		0.007599	O	Mg		0.000883	i	S	<		M	W	<	0.049000				
M	Dy	<	0.000560	M	Mn		0.008626	M	Sb	<	0.003400	M	Y	<	0.001700				
M	Er	<	0.019000	M	Mo	<	0.032000	M	Sc		0.003080	M	Yb	<	0.000560				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 $Cr(H_2O)_6^{3+}$

Chemical Compatibility -Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cr3 Containing Samples (Preparation and Solution) -Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1. B. Fusion with $NaKSO_4$ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, <, C); Organic Matrices (ash at 4500C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S16O, 36Ar16O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

October 26, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **October 26, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 · USA
inorganicventures.com

CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 540.585.3030
fax: 540.585.3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01
ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGNI10
Lot Number:	P2-NI686384
Matrix:	3% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Nickel
Starting Material:	Ni Metal
Starting Material Lot#:	2277 and 2282
Starting Material Purity:	99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL

Density: 1.038 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9971 ± 54 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 120619

Assay Method #2 **9970 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **9993 ± 33 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag		0.002606	M	Eu	<	0.001100	O	Na		0.004965	O	Se	<	0.067000	M	Zn		0.006578
M	Al	<	0.013000	O	Fe		0.018618	M	Nb	<	0.001100	O	Si		0.010923	M	Zr	<	0.001100
O	As	<	0.067000	M	Ga	<	0.001100	M	Nd	<	0.001100	M	Sm	<	0.001100				
M	Au	<	0.002100	M	Gd	<	0.001100	s	Ni	<		M	Sn	<	0.016000				
M	B	<	0.017000	M	Ge	<	0.004200	M	Os		0.002110	O	Sr	<	0.000940				
M	Ba	<	0.001100	M	Hf	<	0.001100	i	P	<		M	Ta	<	0.001100				
O	Be	<	0.000410	M	Hg		0.014895	M	Pb		0.006578	M	Tb	<	0.001100				
M	Bi	<	0.004200	M	Ho	<	0.001100	M	Pd	<	0.001100	M	Te	<	0.015000				
O	Ca		0.003351	M	In	<	0.001100	M	Pr	<	0.001100	M	Th	<	0.001100				
M	Cd		0.001365	M	Ir		0.004716	M	Pt	<	0.001100	M	Ti	<	0.004200				
M	Ce	<	0.001100	O	K		0.004716	M	Rb	<	0.001100	M	Tl	<	0.001100				
O	Co		0.017377	M	La	<	0.001100	M	Re		0.001737	M	Tm	<	0.001100				
O	Cr	<	0.006700	O	Li	<	0.000140	M	Rh	<	0.006300	M	U	<	0.001100				
M	Cs	<	0.007300	M	Lu	<	0.001100	M	Ru	<	0.019000	M	V	<	0.002100				
M	Cu		0.004096	O	Mg		0.000372	i	S	<		M	W	<	0.006300				
M	Dy	<	0.001100	O	Mn	<	0.001900	M	Sb		0.005833	O	Y	<	0.000540				
M	Er	<	0.001100	M	Mo	<	0.008400	M	Sc	<	0.002100	M	Yb	<	0.001100				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H2O)62+

Chemical Compatibility -Stable in HCl, HNO3, H2SO4 ,HF, H3PO4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 02, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
CEO, Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGV10
Lot Number:	S2-V711005
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Vanadium
Starting Material:	Vanadium Pentoxide
Starting Material Lot#:	1782
Starting Material Purity:	99.9877%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10014 ± 30 µg/mL

Density: 1.104 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10017 ± 42 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 160906

Assay Method #2 **10013 ± 30 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000110	M	Eu	<	0.000110	O	Na		0.120000	M	Se	<	0.009400	M	Zn		0.009400
O	Al		0.120000	O	Fe		0.460000	M	Nb	<	0.001300	O	Si		0.270000	M	Zr	<	0.002900
M	As	<	0.000210	M	Ga	<	0.009300	M	Nd	<	0.000610	M	Sm	<	0.000110				
M	Au	<	0.004700	M	Gd	<	0.000110	M	Ni		0.012000	M	Sn		0.003900				
M	B		0.051000	M	Ge	<	0.000410	M	Os	<	0.000110	O	Sr		0.007100				
M	Ba		0.003600	M	Hf	<	0.000110	O	P	<	0.034000	M	Ta	<	0.000110				
O	Be	<	0.000560	M	Hg	<	0.000410	M	Pb		0.001400	M	Tb	<	0.000110				
M	Bi	<	0.000210	M	Ho	<	0.000110	M	Pd	<	0.000410	M	Te	<	0.000110				
O	Ca		0.730000	M	In	<	0.000110	M	Pr	<	0.000110	M	Th	<	0.000210				
M	Cd	<	0.000610	M	Ir	<	0.000110	M	Pt	<	0.000110	M	Ti		0.017000				
M	Ce	<	0.000610	M	K		0.052000	M	Rb	<	0.000310	M	Tl	<	0.000110				
M	Co	<	0.001300	M	La	<	0.000410	M	Re		0.001700	M	Tm	<	0.000110				
O	Cr		0.170000	M	Li	<	0.000810	M	Rh	<	0.000110	M	U	<	0.000410				
M	Cs		0.005600	M	Lu	<	0.000110	M	Ru	<	0.000110	s	V	<					
M	Cu	<	0.001300	M	Mg		0.053000	i	S	<		M	W		0.002000				
M	Dy	<	0.000110	M	Mn		0.007900	M	Sb		0.078000	M	Y	<	0.000110				
M	Er	<	0.000110	M	Mo		0.094000	M	Sc	<	0.000410	M	Yb	<	0.000110				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.94 +5 6 $H_2V_{10}O_{28}^{4-}$

Chemical Compatibility -Soluble in HCl, HNO_3, H_2SO_4, HF, H_3PO_4 and strong basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

V Containing Samples (Preparation and Solution) -Metal (Fusion with NaOH or KOH in Ni0 or Na_2CO_3 / KNO_3); Oxides (V_2O_3 - use HCl, V_2O_4 - use HCl or HNO_3, V_2O_5 - use concentrated acids); Ores (Na_2CO_3 / KNO_3 in Pt0 caution - nitrates attack Pto followed by water extraction of fuseate); Organic Matrices (Ash at 450 EC followed by dissolving according to V_2O_5 above) .

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 51 amu	4 ppt	N/A	34S16O1H, 35Cl16O, 38Ar13C, 36Ar15N, 36Ar14N1H, 37Cl14N,36S15N, 33S18O, 34S17O, 102Ru+2,02Pd+2
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	Hf, Nb
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	Th
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	Mg, U, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGAL10
Lot Number:	T2-AL716102
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Aluminum
Starting Material:	Aluminum Nitrate Nonahydrate
Starting Material Lot#:	2460
Starting Material Purity:	99.9938%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10049 ± 31 µg/mL

Density: 1.087 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10059 ± 40 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 140903

Assay Method #2 **10044 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10049 ± 35 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.002100	M	Eu	<	0.002100	O	Na		0.352819	M	Se	<	0.005200	M	Zn		0.006018
s	Al	<		O	Fe		0.074714	M	Nb	<	0.000520	O	Si		0.017848	O	Zr		0.004358
M	As		0.008716	O	Ga		0.112072	M	Nd	<	0.000520	M	Sm	<	0.000520				
M	Au	<	0.008400	M	Gd	<	0.001100	O	Ni	<	0.006000	M	Sn		0.000747				
O	B	<	0.014000	M	Ge	<	0.005200	M	Os	<	0.000650	O	Sr		0.000518				
O	Ba		0.012867	M	Hf	<	0.004100	n	P	<		M	Ta	<	0.000520				
O	Be	<	0.000270	M	Hg	<	0.002000	M	Pb		0.002282	M	Tb	<	0.000520				
M	Bi		0.001930	M	Ho	<	0.000520	M	Pd	<	0.000520	M	Te	<	0.001100				
O	Ca		0.076790	M	In	<	0.002100	M	Pr	<	0.000520	M	Th	<	0.000520				
M	Cd	<	0.000520	M	Ir	<	0.000650	M	Pt	<	0.000520	O	Ti		0.001930				
M	Ce	<	0.001100	O	K		0.043583	M	Rb	<	0.000520	M	Tl	<	0.000520				
O	Co	<	0.005400	M	La	<	0.002100	M	Re	<	0.000520	M	Tm	<	0.000520				
O	Cr		0.006018	O	Li		0.000112	M	Rh	<	0.000520	M	U	<	0.000520				
M	Cs		0.000643	M	Lu	<	0.000520	M	Ru	<	0.002000	M	V		0.001286				
O	Cu	<	0.008300	O	Mg		0.068488	i	S	<		M	W	<	0.009800				
M	Dy	<	0.002100	O	Mn		0.000913	M	Sb	<	0.003100	M	Y	<	0.001100				
M	Er	<	0.000520	M	Mo		0.005396	O	Sc	<	0.000950	M	Yb	<	0.000520				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98 +3 6 Al(H2O)6+3

Chemical Compatibility -Soluble in HCl, HNO3, v F and v 2SO4. Avoid neutral media. Soluble in strongly basic NaOH forming the Al(OH)4(H2O)21- species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

Al Containing Samples (Preparation and Solution) -Metal (Best dissolved in HCl / HNO3); a- Al2O3 (Na2CO3 fusion in Pt0);

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 27 amu	30 ppt	N/A	12C15N, 13C14N, 1H12C14N, 11B16O, 54Cr2+, 54Fe2+
ICP-OES 167.078 nm	0.1/0.009 µg/mL	1	Fe
ICP-OES 394.401 nm	0.05/0.006 µg/mL	1	U, Ce
ICP-OES 396.152 nm	0.03/0.006 µg/mL	1	Mo, Zr, Ce

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 22, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 22, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGK10
Lot Number:	S2-K711973
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Potassium
Starting Material:	KNO3
Starting Material Lot#:	2313
Starting Material Purity:	99.9971%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 30 µg/mL

Density: 1.024 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9987 ± 24 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10004 ± 84 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 140813

Assay Method #3 **10007 ± 45 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001400	M	Eu	<	0.000660	O	Na		0.246220	M	Se	<	0.007900	O	Zn		0.018056
O	Al		0.001592	O	Fe		0.005909	M	Nb	<	0.000660	O	Si		0.011490	O	Zr	<	0.001600
M	As	<	0.005300	M	Ga	<	0.000660	M	Nd	<	0.000660	M	Sm	<	0.000660				
M	Au	<	0.002000	M	Gd	<	0.000660	O	Ni	<	0.004900	M	Sn	<	0.000660				
O	B	<	0.005600	M	Ge	<	0.002000	M	Os	<	0.003300	O	Sr		0.000055				
O	Ba	<	0.000860	M	Hf	<	0.000660	O	P	<	0.032000	M	Ta	<	0.000660				
O	Be	<	0.000082	M	Hg	<	0.002000	M	Pb	<	0.002300	M	Tb	<	0.000660				
M	Bi	<	0.006600	M	Ho	<	0.000660	M	Pd	<	0.000660	M	Te	<	0.017000				
O	Ca		0.031187	M	In	<	0.000660	M	Pr	<	0.000660	M	Th	<	0.000660				
O	Cd	<	0.000450	M	Ir	<	0.000660	M	Pt	<	0.002700	M	Ti	<	0.000660				
M	Ce	<	0.000660	s	K	<		M	Rb		0.476026	M	Tl	<	0.000660				
O	Co	<	0.000780	M	La	<	0.000660	M	Re	<	0.000660	M	Tm	<	0.000660				
O	Cr		0.000541	O	Li	<	0.000084	M	Rh	<	0.000660	M	U	<	0.000660				
M	Cs	<	0.000660	M	Lu	<	0.000660	M	Ru	<	0.000660	O	V	<	0.001100				
M	Cu	<	0.002700	O	Mg		0.006237	O	S		0.027905	M	W	<	0.000660				
M	Dy	<	0.000660	O	Mn		0.000476	M	Sb	<	0.000660	M	Y	<	0.000660				
M	Er	<	0.000660	M	Mo	<	0.000660	O	Sc	<	0.000340	O	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 39.10 +1 (6) K+(aq)

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Avoid use of HClO4 due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO4-.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt0 followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 39 amu	10 ppt	n/a	38ArH, 23Na16O, 78Se
ICP-OES 404.721 nm	1.1 / 0.05 µg/mL	1	U, Ce
ICP-OES 766.490 nm	0.4 / 0.001 µg/mL	1	2nd order radiation from R.E.s on some optical designs
ICP-OES 771.531 nm	1.0 / 0.03 µg/mL	1	2nd order radiation from R.E.s on some optical designs

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 10, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 10, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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Christiansburg, VA 24073 USA
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGMG10
Lot Number:	S2-MG704239
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Magnesium
Starting Material:	Magnesium Metal
Starting Material Lot#:	2168
Starting Material Purity:	99.9984%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10053 ± 30 µg/mL

Density: 1.053 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10022 ± 62 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 140110

Assay Method #2 **10078 ± 26 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10033 ± 26 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Ag		0.002106	M	Eu	<	0.000910	O	Na		0.071075	O	Se	<	0.048000	O	Zn		0.003299
M	Al		0.003553	M	Fe		0.002538	M	Nb	<	0.000460	O	Si	<	0.032000	O	Zr	<	0.002700
M	As	<	0.001400	M	Ga	<	0.000460	M	Nd	<	0.000910	M	Sm	<	0.000460				
M	Au	<	0.001400	M	Gd	<	0.000460	O	Ni	<	0.001600	M	Sn	<	0.002300				
O	B		0.006853	M	Ge	<	0.001400	M	Os	<	0.000460	O	Sr		0.000279				
O	Ba		0.000964	M	Hf	<	0.000460	O	P		0.015230	M	Ta	<	0.000460				
O	Be	<	0.000120	M	Hg	<	0.000460	M	Pb	<	0.000460	M	Tb	<	0.000460				
M	Bi	<	0.000460	M	Ho	<	0.000460	M	Pd	<	0.003200	M	Te	<	0.007300				
O	Ca		0.053306	M	In	<	0.000460	M	Pr	<	0.000460	M	Th	<	0.000460				
O	Cd	<	0.000360	M	Ir	<	0.000460	M	Pt	<	0.001900	O	Ti	<	0.001700				
M	Ce	<	0.002300	M	K		0.048229	M	Rb		0.002411	M	Tl		0.003046				
M	Co	<	0.000910	M	La	<	0.002800	M	Re	<	0.000460	M	Tm	<	0.000460				
M	Cr	<	0.002300	O	Li		0.027922	M	Rh	<	0.000460	M	U	<	0.000460				
M	Cs		0.001040	M	Lu	<	0.000460	M	Ru	<	0.000460	M	V	<	0.000460				
O	Cu	<	0.003000	s	Mg	<		O	S	<	0.190000	M	W	<	0.000460				
M	Dy	<	0.000460	O	Mn		0.015230	M	Sb		0.020814	O	Y	<	0.000720				
M	Er	<	0.000460	M	Mo	<	0.000910	O	Sc	<	0.000480	M	Yb	<	0.000460				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.31 +2 6 Mg(H2O)6+2

Chemical Compatibility -Soluble in HCl, HNO3, and H2SO4 avoid HF, H3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO3 / LDPE container.

Mg Containing Samples (Preparation and Solution) -Metal (Best dissolved in diluted HNO3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 24 amu	42 ppt	n/a	7Li17O, 48Ti+2 , 48Ca+2
ICP-OES 279.553 nm	0.0002 / 0.00003 µg/mL	1	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 µg/mL	1	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 µg/mL	1	U, Hf, Cr, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 23, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 23, 2025**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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F: 540-585-3012
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGCA10
Lot Number:	T2-CA716103
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Calcium
Starting Material:	CaCO3
Starting Material Lot#:	2472
Starting Material Purity:	99.9950%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10005 ± 30 µg/mL

Density: 1.039 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **10005 ± 45 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 130213

Assay Method #2 **10005 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

Assay Method #3 **10005 ± 31 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001200	M	Eu	<	0.001200	O	Na		0.006112	M	Se	<	0.024000	M	Zn		0.005362
M	Al		0.065419	O	Fe		0.009115	M	Nb	<	0.001200	O	Si		0.139417	O	Zr	<	0.006700
O	As	<	0.013000	M	Ga	<	0.015000	M	Nd	<	0.020000	M	Sm	<	0.001200				
M	Au	<	0.017000	M	Gd	<	0.004800	O	Ni		0.000793	M	Sn	<	0.003600				
O	B		0.001179	M	Ge	<	0.003600	M	Os	<	0.001200	M	Sr		0.081505				
O	Ba		0.002788	M	Hf	<	0.001200	O	P	<	0.041000	M	Ta	<	0.001200				
O	Be	<	0.000410	M	Hg	<	0.004800	M	Pb		0.001608	M	Tb	<	0.001200				
M	Bi		0.001608	M	Ho	<	0.001200	M	Pd	<	0.001200	M	Te	<	0.003600				
s	Ca	<		M	In	<	0.001200	M	Pr		0.000257	M	Th	<	0.001200				
O	Cd	<	0.001300	M	Ir	<	0.001200	M	Pt	<	0.003600	O	Ti	<	0.001900				
M	Ce		0.001029	O	K		0.009759	M	Rb	<	0.001200	M	Tl	<	0.001200				
O	Co		0.000418	M	La		0.001823	M	Re	<	0.001200	M	Tm	<	0.001200				
O	Cr		0.003324	O	Li	<	0.007300	M	Rh	<	0.001200	M	U		0.002144				
M	Cs		0.007399	M	Lu		0.000128	M	Ru	<	0.001200	M	V		0.001286				
O	Cu	<	0.011000	M	Mg		1.286934	O	S		0.055767	O	W	<	0.024000				
M	Dy	<	0.002400	O	Mn		0.004611	M	Sb	<	0.009600	O	Y		0.000536				
M	Er	<	0.002400	M	Mo		0.003539	O	Sc	<	0.001400	M	Yb	<	0.001200				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.08 +2 6 Ca(H2O)6+2

Chemical Compatibility - Soluble in HCl and HNO3. Avoid H2SO4, v F, v 3PO4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO3 / LDPE container.

Ca Containing Samples)Preparation and Solution) -Metal (best dissolved in diluted HNO3); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO2). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO3. The sulfates (gypsum, anhydrite, etc.), certain silicates, and complex compounds require fusion with Na2CO3 followed by HCl / water dissolution. Note that contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 44 amu	1200 ppt	n/a	16O212C, 28Si16O, 88Sr
ICP-OES 393.366 nm	0.0002 / 0.00004 µg/mL	1	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 µg/mL	1	Th
ICP-OES 422.673 nm	0.01 / 0.001 µg/mL	1	Ge

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 14, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 14, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

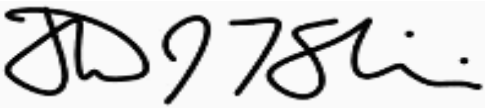
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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Christiansburg, VA 24073 USA
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P: 800-669-6799/540-585-3030
F: 540-585-3012
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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGNA10
Lot Number:	T2-NA717221
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	10 000 µg/mL ea: Sodium
Starting Material:	Na2CO3
Starting Material Lot#:	2358 and 2453
Starting Material Purity:	99.9977%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9977 ± 30 µg/mL

Density: 1.033 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **9974 ± 18 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **9977 ± 34 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 200413

Assay Method #3 **9987 ± 31 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000930	M	Eu	<	0.000930	s	Na	<		M	Se	<	0.003800	O	Zn		0.000138
M	Al		0.004409	O	Fe		0.002393	M	Nb	<	0.000930	O	Si		0.056696	O	Zr	<	0.003200
O	As	<	0.023000	M	Ga	<	0.000930	M	Nd	<	0.000930	M	Sm	<	0.000930				
O	Au	<	0.004100	M	Gd	<	0.000930	O	Ni	<	0.003000	M	Sn	<	0.002800				
O	B		0.001385	M	Ge	<	0.004700	M	Os	<	0.000930	O	Sr		0.000251				
M	Ba		0.004031	M	Hf	<	0.000930	O	P		0.010205	M	Ta	<	0.000930				
O	Be	<	0.000130	M	Hg	<	0.000930	M	Pb	<	0.000930	M	Tb	<	0.000930				
M	Bi	<	0.000930	M	Ho	<	0.000930	M	Pd	<	0.000930	M	Te	<	0.001900				
O	Ca		0.176388	M	In	<	0.000930	M	Pr	<	0.000930	M	Th		0.000352				
O	Cd	<	0.000860	M	Ir	<	0.000930	M	Pt	<	0.000930	O	Ti		0.000592				
M	Ce	<	0.001900	O	K		0.302380	M	Rb	<	0.000930	M	Tl	<	0.000930				
O	Co	<	0.001800	O	La	<	0.002100	M	Re	<	0.000930	M	Tm	<	0.000930				
M	Cr	<	0.002800	O	Li		0.000031	M	Rh	<	0.000930	M	U	<	0.000930				
M	Cs	<	0.000930	M	Lu	<	0.000930	M	Ru	<	0.001900	O	V	<	0.001600				
O	Cu	<	0.003900	O	Mg		0.026458	O	S		0.040317	O	W	<	0.028000				
M	Dy	<	0.000930	O	Mn	<	0.000740	M	Sb	<	0.000930	O	Y	<	0.000860				
M	Er	<	0.000930	O	Mo	<	0.003600	O	Sc	<	0.000610	O	Yb	<	0.000250				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.99 +1 (6) Na+(aq) largely ionic in nature

Chemical Compatibility -Soluble in HCl, HNO3, H2SO4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 23 amu	310 ppt	n/a	46Ti+2 , 46Ca+2
ICP-OES 330.237 nm	2.0 / 0.09 µg/mL	1	Pd, Zn
ICP-OES 588.995 nm	0.03 / 0.006 µg/mL	1	2nd order radiation from R.E.s on some optical designs
ICP-OES 589.595 nm	0.07 / 0.00009 µg/mL	1	2nd order radiation from R.E.s on some optical designs

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 20, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 20, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

Refine your results. Redefine your industry.

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Single Analyte Custom Grade Solution
Catalog Number:	CGU1
Lot Number:	S2-U707914
Matrix:	2% (v/v) HNO3
Value / Analyte(s):	1 000 µg/mL ea: Uranium
Starting Material:	Uranyl Nitrate Hexahydrate
Starting Material Lot#:	P2-2322
Starting Material Purity:	99.9997%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 999 ± 5 µg/mL

Density: 1.010 g/mL (measured at 20 ± 4 ºC)

Assay Information:

Assay Method #1 **998 ± 5 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 080521

Assay Method #2 **1001 ± 6 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.19 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.000270	M	Eu	<	0.000270	M	Na	<	0.011000	M	Se	<	0.009300	M	Zn		0.002358
M	Al	<	0.011000	M	Fe		0.003222	M	Nb	<	0.000270	M	Si	<	0.160000	M	Zr	<	0.001100
M	As	<	0.002400	M	Ga	<	0.000270	M	Nd	<	0.000270	M	Sm	<	0.000270				
M	Au	<	0.000270	M	Gd	<	0.000270	M	Ni	<	0.020000	M	Sn	<	0.011000				
M	B	<	0.000270	M	Ge	<	0.000800	M	Os	<	0.001900	M	Sr	<	0.000270				
M	Ba	<	0.003800	M	Hf	<	0.000270	i	P	<		M	Ta	<	0.000270				
M	Be	<	0.000270	M	Hg	<	0.000540	M	Pb	<	0.002200	M	Tb	<	0.000270				
M	Bi	<	0.000270	M	Ho	<	0.000270	M	Pd	<	0.000540	M	Te	<	0.003800				
M	Ca	<	0.140000	M	In	<	0.000270	M	Pr	<	0.000270	M	Th		0.000129				
M	Cd	<	0.000270	M	Ir	<	0.000270	M	Pt	<	0.000270	M	Ti	<	0.002700				
M	Ce	<	0.000540	O	K	<	0.250000	M	Rb	<	0.000800	M	Tl	<	0.000270				
M	Co	<	0.000800	M	La		0.000117	M	Re	<	0.064000	M	Tm	<	0.000270				
M	Cr		0.000943	M	Li	<	0.003000	M	Rh	<	0.000270	s	U	<					
M	Cs		0.000106	M	Lu	<	0.000270	M	Ru	<	0.000540	M	V	<	0.000540				
M	Cu	<	0.001100	M	Mg	<	0.003000	i	S	<		M	W	<	0.000540				
M	Dy	<	0.000270	M	Mn	<	0.006900	M	Sb	<	0.000270	M	Y	<	0.000270				
M	Er	<	0.000270	M	Mo	<	0.006400	M	Sc	<	0.000540	M	Yb	<	0.000270				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.03 +6 8 UO22+(uranyl)

Chemical Compatibility - Soluble in HCl and HNO3. Avoid H3PO4. H2SO4 and HF matrices should not be a problem depending upon [U]. Although the UO22+ ion is distinctly basic, any U+4 will precipitate in basic media. UO22+salts are generally soluble in water and UO22+ is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF4 and UF6 are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO3 / LDPE container.

U Containing Samples (Preparation and Solution) -Metal (Dissolves rapidly in HCl and HNO3); Oxide (Soluble in HNO3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H2SO4.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	**Estimated D.L.**	**Order**	**Interferences** (underlined indicates severe)
ICP-MS 238 amu	2 ppt	N/A	206Pb16O2
ICP-OES 263.553 nm	0.3 / 0.01 µg/mL	1	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-OES 367.007 nm	0.3 / 0.02 µg/mL	1	Th, Ce
ICP-OES 385.958 nm	0.3 / 0.01 µg/mL	1	Th, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 28, 2021

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 28, 2026**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	AR-ICVMS-2
Lot Number:	T2-MEB719895
Matrix:	3% (v/v) HNO3 tr. HF
Value / Analyte(s):	2.5 µg/mL ea: Molybdenum, Antimony

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Antimony, Sb	**2.499 ± 0.015 µg/mL**	**Molybdenum, Mo**	**2.500 ± 0.017 µg/mL**

Density: 1.014 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Mo	ICP Assay	3134	130418
Mo	Calculated		See Sec. 4.2
Sb	ICP Assay	3102a	140911
Sb	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 06, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 06, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control

Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

Certificate of Analysis

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1.0 ACCREDITATION / REGISTRATION

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ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code:	Multi Analyte Custom Grade Solution
Catalog Number:	AR-ICVMS-3
Lot Number:	T2-MEB719896
Matrix:	7% (v/v) HNO3
Value / Analyte(s):	250 µg/mL ea: Aluminum, Calcium, Iron, Potassium, Magnesium, Sodium, 4 µg/mL ea: Selenium, 2.5 µg/mL ea: Thorium, Thallium, Uranium, Vanadium, Zinc, Manganese, Cadmium, Cobalt, Chromium, Copper, Arsenic, Barium, Beryllium, Nickel, Lead, Silver

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	250.0 ± 0.9 µg/mL	Arsenic, As	2.500 ± 0.018 µg/mL
Barium, Ba	2.501 ± 0.013 µg/mL	Beryllium, Be	2.501 ± 0.015 µg/mL
Cadmium, Cd	2.501 ± 0.013 µg/mL	Calcium, Ca	250.0 ± 1.3 µg/mL
Chromium, Cr	2.500 ± 0.015 µg/mL	Cobalt, Co	2.500 ± 0.014 µg/mL
Copper, Cu	2.500 ± 0.014 µg/mL	Iron, Fe	250.0 ± 1.0 µg/mL
Lead, Pb	2.500 ± 0.013 µg/mL	Magnesium, Mg	250.0 ± 1.3 µg/mL
Manganese, Mn	2.500 ± 0.014 µg/mL	Nickel, Ni	2.500 ± 0.014 µg/mL
Potassium, K	250.0 ± 1.2 µg/mL	Selenium, Se	4.002 ± 0.024 µg/mL
Silver, Ag	2.501 ± 0.017 µg/mL	Sodium, Na	250.0 ± 1.2 µg/mL
Thallium, Tl	2.500 ± 0.017 µg/mL	Thorium, Th	2.499 ± 0.013 µg/mL
Uranium, U	2.501 ± 0.015 µg/mL	Vanadium, V	2.500 ± 0.014 µg/mL
Zinc, Zn	2.500 ± 0.014 µg/mL		

Density: 1.042 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	160729
Ag	Volhard	999c	999c
Ag	Calculated		See Sec. 4.2
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
As	ICP Assay	3103a	100818
Ba	ICP Assay	3104a	140909
Ba	Calculated		See Sec. 4.2
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	090514
Be	Calculated		See Sec. 4.2
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cd	ICP Assay	3108	130116
Cd	EDTA	928	928
Cd	Calculated		See Sec. 4.2
Co	ICP Assay	3113	190630
Co	EDTA	928	928
Co	Calculated		See Sec. 4.2
Cr	ICP Assay	3112a	170630
Cr	Calculated		See Sec. 4.2
Cu	ICP Assay	3114	121207
Cu	EDTA	928	928
Cu	Calculated		See Sec. 4.2
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Mn	Calculated		See Sec. 4.2
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Ni	Calculated		See Sec. 4.2
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Pb	Calculated		See Sec. 4.2
Se	ICP Assay	3149	100901
Se	Calculated		See Sec. 4.2
Th	EDTA	928	928
Th	Calculated		See Sec. 4.2
Tl	ICP Assay	3158	151215
Tl	Calculated		See Sec. 4.2
U	ICP Assay	3164	080521
U	Calculated		See Sec. 4.2

V	ICP Assay	3165	160906
V	EDTA	928	928
Zn	ICP Assay	3168a	120629
Zn	EDTA	928	928
Zn	Calculated		See Sec. 4.2

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.19 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

Note: This solution contains Silver (Ag), please refer to our Sample Preparation Guide for more information.

https://www.inorganicventures.com/sample-preparation-guide/samples-containing-silver

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 06, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 06, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

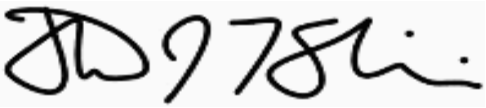
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director

ERA
A Waters Company

Certified Reference Material

▪ Certificate of Analysis ▪

Product: Metals in Soil
Catalog Number: 540
Lot No. D120-540
Certificate Issue Date: December 16, 2022
Expiration Date: April 01, 2026
Revision Number: Original

L 000950

Product use instructions are included as part of the certification packet and are paginated separately from this Certificate of Analysis. Please reference the product use instructions for catalog #540 revision 111122.

CERTIFICATION

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Aluminum	9420	5640	2.77	1720 - 9560	2550 - 10400
Antimony	225	97.9	31.4	D.L. - 211	22.5 - 251
Arsenic	66.6	73.9	3.11	63.4 - 84.5	51.8 - 96.1
Barium	354	311	3.79	253 - 370	234 - 389
Beryllium	108	92.9	3.20	75.8 - 110	69.7 - 119
Boron	102	56.1	6.31	33.7 - 78.4	33.6 - 112
Cadmium	91.8	75.4	17.5	61.0 - 89.8	56.6 - 101
Calcium	2640	2580	2.84	2140 - 3030	1760 - 3410
Chromium	137	116	4.95	93.1 - 139	81.3 - 151
Cobalt	137	118	7.94	96.3 - 139	88.2 - 151
Copper	139	114	12.1	92.9 - 136	85.8 - 153
Iron	7100	6160	2.51	3500 - 8810	710 - 12700
Lead	247	212	4.43	170 - 253	156 - 272
Lithium	8.14	5.11	5.23	2.35 - 7.87	0.814 - 10.8
Magnesium	1560	1350	3.92	1010 - 1690	668 - 2030
Manganese	286	255	3.26	205 - 304	187 - 322
Mercury	14.9	15.1	7.72	11.1 - 19.1	9.09 - 21.2
Molybdenum	47.5	49.1	36.3	40.7 - 57.5	33.3 - 64.9
Nickel	295	252	69.7	204 - 299	176 - 327
Potassium	1800	1620	3.33	1170 - 2080	898 - 2340
Selenium	93.6	75.1	24.9	57.3 - 93.0	47.2 - 103
Silver	80.6	65.7	38.8	50.4 - 81.0	46.4 - 88.7
Sodium	232	244	3.54	189 - 299	122 - 365
Strontium	133	94.9	3.96	70.8 - 119	68.1 - 146

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▪ Certificate of Analysis ▪

Parameter	Certified Value[1]	Reference Value	Uncertainty[2]	QC Performance Acceptance Limits[3]	PT Performance Acceptance Limits[4]
	mg/kg	mg/kg	%	mg/kg	mg/kg
Thallium	158	129	21.1	101 - 157	89.5 - 174
Tin	113	89.6	23.1	67.4 - 112	49.9 - 129
Titanium	145	126	8.56	39.3 - 213	0.00 - 268
Uranium	48.2	40.8	3.84	29.4 - 52.3	28.4 - 53.2
Vanadium	116	96.1	6.62	73.6 - 119	64.2 - 128
Zinc	184	156	3.83	123 - 189	109 - 203

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ERA
A Waters Company

Certified Reference Material

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ANALYTICAL VERIFICATION

Parameter	Certified Value[1]	Proficiency Testing Study			NIST Traceability	
		Mean	Recovery[5]	n	SRM Number[6]	Recovery
	mg/kg	mg/kg	%			%
Aluminum	9420	5640	59.9	101	-	-
Antimony	225	97.9	43.5	106	-	-
Arsenic	66.6	73.9	111	141	-	-
Barium	354	311	88.0	127	-	-
Beryllium	108	92.9	86.0	119	-	-
Boron	102	56.1	55.0	80	-	-
Cadmium	91.8	75.4	82.1	160	-	-
Calcium	2640	2580	97.9	102	-	-
Chromium	137	116	84.8	141	-	-
Cobalt	137	118	85.8	112	-	-
Copper	139	114	82.3	151	-	-
Iron	7100	6160	86.7	105	-	-
Lead	247	212	85.7	170	-	-
Lithium	8.14	5.11	62.8	14	-	-
Magnesium	1560	1350	86.4	102	-	-
Manganese	286	255	89.0	123	-	-
Mercury	14.9	15.1	102	108	-	-
Molybdenum	47.5	49.1	103	117	-	-
Nickel	295	252	85.3	149	-	-
Potassium	1800	1620	90.1	104	-	-
Selenium	93.6	75.1	80.3	122	-	-
Silver	80.6	65.7	81.5	117	-	-
Sodium	232	244	105	99	-	-
Strontium	133	94.9	71.4	76	-	-
Thallium	158	129	81.7	109	-	-
Tin	113	89.6	79.3	78	-	-
Titanium	145	126	87.1	70	-	-
Uranium	48.2	40.8	84.7	30	-	-
Vanadium	116	96.1	82.8	112	-	-
Zinc	184	156	84.7	153	-	-

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▪ Certificate of Analysis ▪

1. The **Certified Values** are the actual gravimetric/volumetric "made-to" concentrations confirmed by ERA analytical verification. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

2. The **Uncertainty** represents an expanded uncertainty and approximates a 95% confidence interval. The uncertainty is based on the characterization, homogeneity and stability characteristics of the product, multiplied by a coverage factor (k=2). The uncertainty applies to the product as supplied and does not take into account any required or optional dilution and/or preparations the laboratory may perform while using this product. The formula used to calculate the expanded uncertainty is:
$U_{expanded} = k * SQRT((U_{char}^2) + (U_{homogen}^2) + (U_{LTS}^2) + (U_{STS}^2) + (U_{RSS}^2))$

Where:

Uexpanded = Expanded uncertainty.
k = Coverage factor.
Uchar = Combined standard uncertainty of the manufacturing and/or analytical verification assessment.
Uhomogen = Standard uncertainty of the homogeneity assessment.
ULTS = Standard uncertainty associated with long-term stability.
USTS = Standard uncertainty associated with short-term (transport) stability.
URSS = Standard uncertainty associated with repeated sampling of the product (where permitted by product use instructions).

3. The **QC Performance Acceptance Limits (QC PALs™)** are based on actual historical data collected in ERA's Proficiency Testing program. The QC PALs™ reflect any inherent biases in the methods used to establish the limits and closely approximate a 95% confidence interval of the performance that experienced laboratories should achieve using accepted environmental methods. Use the QC PALs™ to realistically evaluate your performance against your peers.

4. The **PT Performance Acceptance Limits (PT PALs™)** are calculated using the regression equations and fixed acceptance criteria specified in the NELAC proficiency testing requirements. Use the PT PALs™ when analyzing this certified reference material alongside USEPA and NELAC compliant PT study materials. Please note that many PT study acceptance limits are concentration dependent (some non-linearly) and therefore, the acceptance limits of this certified reference material and any PT study material may differ relative to their difference in concentrations.

5. The **PT Performance Data** include the mean value, percent recovery and number of data points reported by laboratories in our Proficiency Testing study compared to the Certified Values. In the event this lot was not used in a proficiency testing scheme, the data displayed was generated internally by ERA.

6. Where NIST Standard Reference Materials (SRMs) are available, each analyte has been analytically traced to the NIST SRM listed. **Analytical Traceability Recovery (%)** = [(% recovery ERA certified reference material)/(% recovery NIST SRM)]*100
The traceability data shown were compiled by analyzing this ERA certified reference material and/or it's associated stock solution(s) against the applicable NIST SRMs.

7. **Metrological Traceability.** This certified reference material is metrologically traceable to NIST mass reference materials through an unbroken chain of comparisons.

8. For additional information on this product such as intended use, storage information, instructions for use, minimum sample size, and safety information, please refer to the Product Use Instructions provided.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or send an email to info@eraqc.com.

Certifying Officer

Brian Miller

Brian Miller

Senior Technical Manager

Craig Huff

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Certificate of Analysis

Refine your results. Redefine your industry.

300 Technology Drive
Christiansburg, VA 24073 USA
inorganicventures.com

P: 800-669-6799/540-585-3030
F: 540-585-3012
info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED Testing Laboratory Certificate 883.01

ACCREDITED Reference Material Producer Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: AR-6020ICS-0A10

Lot Number: T2-MEB719898

Matrix: 1.4% (v/v) HNO3

Value / Analyte(s):

1 000 µg/mL ea:
Chloride,

200 µg/mL ea:
Carbon,

100 µg/mL ea:
Calcium, Aluminum,
Iron, Potassium,
Magnesium, Sodium,
Phosphorus, Sulfur,

2 µg/mL ea:
Titanium, Molybdenum

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	**100.0 ± 0.4 µg/mL**	**Calcium, Ca**	**100.0 ± 0.5 µg/mL**
Carbon, C	**200.1 ± 0.5 µg/mL**	**Chloride, Cl**	**1 000 ± 5 µg/mL**
Iron, Fe	**100.0 ± 0.5 µg/mL**	**Magnesium, Mg**	**100.0 ± 0.5 µg/mL**
Molybdenum, Mo	**2.001 ± 0.014 µg/mL**	**Phosphorus, P**	**100.0 ± 0.6 µg/mL**
Potassium, K	**100.0 ± 0.5 µg/mL**	**Sodium, Na**	**100.0 ± 0.5 µg/mL**
Sulfur, S	**100.0 ± 0.5 µg/mL**	**Titanium, Ti**	**2.001 ± 0.015 µg/mL**

Density: 1.009 g/mL (measured at 20 ± 4 ºC)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
C	Acidimetric	84L	84L
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Cl	Acidimetric	84L	84L
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mo	ICP Assay	3134	130418
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
S	Acidimetric	84L	84L
S	ICP Assay	traceable to 3154	P2-S680745
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$X_{CRM/RM} = \Sigma(w_i)(X_i)$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$w_i = (1/u_{char\ i})^2 / (\Sigma(1/(u_{char\ i})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char} = [\Sigma((w_i)^2\,(u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM} = (X_a)\,(u_{char\ a})$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit **www.inorganicventures.com/TCT**

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 07, 2022

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 07, 2027**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

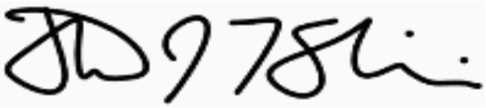
- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Thomas Kozikowski
Manager, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director